THE
BRASS WORLD
AND
PLATERS' GUIDE

A JOURNAL
DEVOTED TO THE
ART OF REFINING,
ALLOYING, CASTING,
ROLLING, FOUNDING,
AND ELECTROPLATING
OF ALL THE
NON-FERROUS
METALS

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EDITED BY
ERWIN S. SPERRY

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THE BRASS WORLD AND PLATERS' GUIDE

VOL. VIII. BRIDGEPORT, CONN., JANUARY, 1912. No. 1.

A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.

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ERWIN S. SPERRY . . . . . EDITOR

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Contents for January.

Balls, Apparatus for Burnishing by Steel.. 26
Brass Ingots, Red 19
Brass and Bronze Plating Solutions 21
Britannia-Metal Sheet, Making Compound.. 10
Bronze and Brass Plating Solutions and How to Make Them 21
Cadmium and Silver Alloy, Plating with... 24
Celluloid, Coating Plating Racks with..... 2
Copper and Steel Wire, Making Compound.. 22
Detinning Old Tin Cans, Difficulty in 2
Dynamo, New Type of Plating 29
Electric Furnaces, New Form of 3
Etching and Piercing of Metals by the Transfer Process 11
Gas Furnaces in Sheffield, England 9
Hardness of Metals, Methods for Testing... 28
Ingots, Red Brass 19
Nickel Plated Steel Goods, Reducing Cost of 8
Patent Abstracts 32
Phosphor-Bronze, Keeping Zinc Out of 1
Plating Racks with Celluloid, Coating..... 2
Press, A Double Acting Cam 27
Questions and Answers 30
Sand-Blast, Self-Contained 24
Scrap Metals, Pittsburgh Electric Furnace for Melting 3
Silver and Cadmium, Electrodeposition of.. 24
Steel Goods, Nickel Plating 8
Trade Items 34
Transfer Process of Etching 11
"Traud" Pan Grinding Machine 26
Zinc Out of Phosphor-Bronze, Keeping 1

Keeping Zinc Out of Phosphor-Bronze.

The most common error made by brass founders, is to use zinc in a phosphor-bronze mixture. When this is done, the resulting mixture really ceases to be a phosphor-bronze as the phosphorus loses its efficiency when zinc is present, and if added in an amount that should be used in a phosphor-bronze mixture, causes blowholes and segregation which injure the castings made from it. To be sure, a small amount of phosphorus is advantageous in a bronze mixture containing zinc when scrap is used, as it then acts as a flux and cleanses the metal from oxide; but the amount must be very small, much smaller, in fact, than would be employed in a phosphor-bronze, otherwise a direct injury results.

Phosphor-bronzes, as now used, are of two kinds.

1. Those without lead and which are used where strength and toughness are desired.

2. Those containing lead and used for bearings only.

Both of these mixtures are supposed to be free from zinc and if added, the bronzes should not be called phosphor-bronzes, as far as the strict use of the word goes.

The disadvantage of zinc in a phosphor-bronze is that it causes blowholes, pinholes or segregation. Zinc and phosphorus are both strong deoxidizing agents and do not seem to work well in the same mixture. It has been found that if zinc is present, the amount of phosphorus used cannot be more than a few hundredths of a per cent without incurring

danger of pinholes. When zinc is absent, however, a large amount of phosphorus can be used if desired.

In the early days of phosphor-bronze, makers of phosphorus alloys, such as phosphor-tin or phosphor-copper, gave formulas for two kinds of metals: One without zinc, and cheaper mixtures containing zinc. It was soon found, however, that these cheaper mixtures were unsatisfactory as too much phosphorus was recommended.

If good grades of phosphor-bronze are desired, keep zinc out of the mixtures as it will cause pinholes and general unsoundness. The bronze without it will be stronger, tougher and better in every way.

It is suggested that the use of the name "phosphor-bronze" be restricted to copper and tin, or copper tin and lead alloys containing phosphorus and free from zinc. Heretofore, it has been difficult to define phosphor-bronze, and this designation would appear to come as near to the solution as any, and at the same time the mixtures are good ones and the designation logical.

Difficulty in Detinning Old Tin Cans.

The present high price of tin has stimulated the desire of scrap metal dealers to find some process of reclaiming the tin on old tin cans, millions of which are thrown away yearly. They can be obtained almost for the cost of picking up and it would, therefore, appear that such a process might be very profitable.

The difficulty in the way of reclaiming the tin from old tin cans is in the amount of refuse they contain. They are rarely free from food, and when picked from a dump are filled with ashes and other refuse. In addition to this, they are covered with a paper label and frequently varnished besides.

There are several well known processes for reclaiming tin from scrap tin plate, either in the form of clippings or tin cans, and they all consist of dissolving off the tin by some acid or similar solvent and leaving the iron. A very simple method is to dissolve off the tin with muriatic acid, and then precipitate it with galvanized iron clippings. A method followed in the large detinning plants is to remove the tin by means of stannic chloride which does not attack the iron appreciably; but this requires expensive apparatus. The muriatic acid method can be used without expensive installation.

If tin cans are used, however, before the tin can be dissolved off by any substance, the food, labels and other foreign matter must be removed and this is the obstacle in the way. There is so much foreign matter to be removed and it is present in such an excess that the detinning of old tin cans is not considered profitable on this account.

There are several plants in the United States which carry on detinning, but they all work on sheet tin clippings which are clean and require no preliminary treatment.

Coating Plating Racks with Celluloid.

In plating articles on racks, it is always desired to keep the metal from the racks as much as possible. This is particularly true of special shaped racks that are comparatively costly, and also in the case of precious metals like gold or silver. When the metal accumulates to such an extent upon the racks as to render them no longer fit for use, they must either be sold to junk dealers, or stripped. In the case of gold and silver racks, it is customary to strip them, of course, but other metals do not pay and the racks are sold. In either case, there is an expense attached which would be obviated if the metal could be prevented from depositing upon the portions of the rack where not wanted.

In a number of plating establishments, the use of celluloid is now being tried and so far it has given very good satisfaction. It seems to stand a cyanide solution well and its employment so far has been confined to silver plating which is, of course, done cold. Celluloid will not stand hot cyanide solutions.

The celluloid is easily put on the rack. All that is necessary is to make a solution of it and paint it on or dip the rack into it and allow to dry. The celluloid is dissolved in acetone until a thick syrup is produced and this is used for covering the rack. The rack must be clean before covering.

The first attempt to cast brass in sand in America was made by John Winthrop, Jr., at his iron foundry in Lynn, Mass., in the year 1644.

A New Form of Electric Furnace for Melting Drosses, Brasses, Bronzes, Scrap Metals, Silver and Other Non-Ferrous Metals and Alloys.

Electric furnaces have always been attractive to those who are obliged to melt metals for the reason that practically unlimited heat may be obtained in them, with freedom from products of combustion and control of temperature. These features, of course, are supposed to be obtained from a theoretical standpoint, but heretofore it has been difficult to obtain them to a perfectly satisfactory degree from a commercial standpoint. Up to the present time, electric furnaces have been made in three distinct types:

1. Resistance Furnaces.
2. Arc Furnaces.
3. Induction Furnaces.

Resistance furnaces have always been attractive for the reason that metals may be melted in crucibles or in any desired way by their employment. The principle lies in the use of a resistance element through which the electric current passes. It is well known, of course, that a current of electricity, passing through any substance heats it to a greater or less degree for the reason that no metals, even copper or silver, which are the best electrical conductors, offer free passage to an electric current. Although a slight current does not raise the temperature to a noticeable degree, there is nevertheless, a rise in heat. When the current is increased, however, the temperature rises until actual melting of the metal conductor takes place. The principle of the resistance furnace is in the use of an electric conductor placed over, under or around the material to be melted. The electric current is passed through and raises the temperature of the conductor proportionate to the amount of current passing. Theoretically this is a very pretty proposition as the temperature may be controlled by the use of a suitable rheostat,

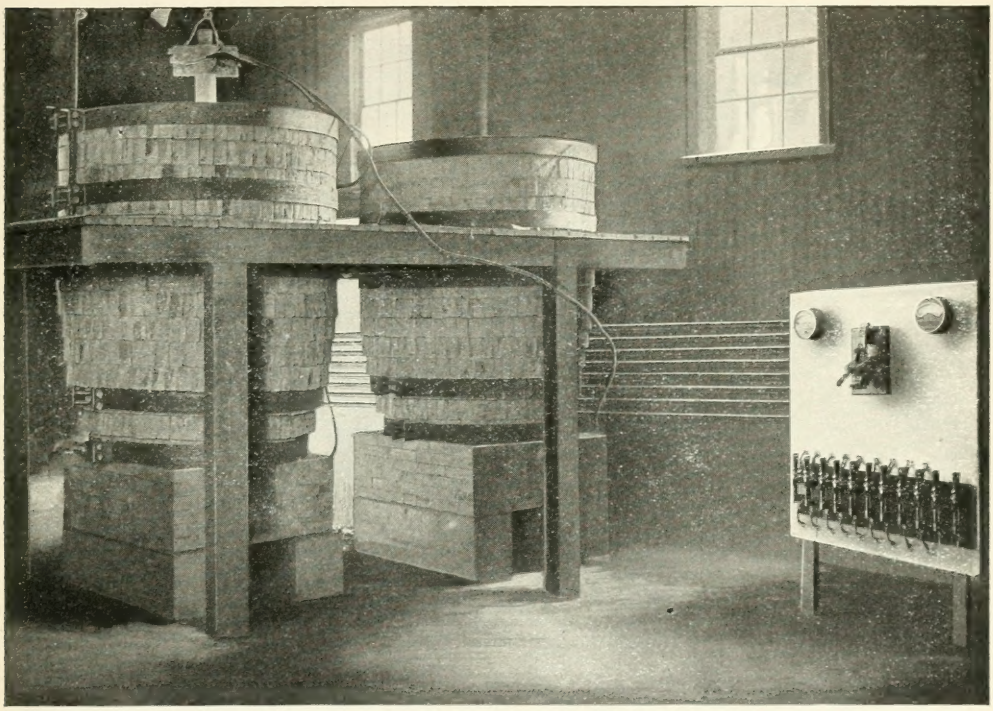


Fig. 1. The "Wile" Stationary Electric Furnaces as Used for Smelting Tin-Dross.

so that the quantity of current passing may be regulated. An ammeter, therefore, is adjusted so that the readings indicate temperature and a pyrometer is not required.

The difficulty with the resistance furnace has been in the use of a suitable material for the resistance element. Metals, of course, are suitable for low temperatures, but are open to the objection that an increase in current by accident or rise in voltage melts them and they become ruined. Non-metallic elements such as graphite have been employed and give good results, but so far, such furnaces have not been used to any extent for large installations, and are confined more to the melting of small quantities of metals in laboratories, and for annealing, hardening and similar muffle work.

The arc furnace acts upon the principle of the arc lamp in which two carbon electrodes are placed in close proximity with one another. The current jumps from one to the other making an arc. This was the first form of electric furnace and is the one by which the highest temperatures can be obtained. It is used extensively in the steel industry. It is open to the objection, however, as far as melting of the non-ferrous metals is concerned, that the temperature is too high and there is a contamination from carbon. The use of an arc also requires a high voltage in order to jump the current from one electrode to the other.

The induction furnace is the most attractive of all electric furnace propositions. Its principle rests upon the use of an alternating current and the formation of an induced current. The primary current passes through a core of suitable shape, and a secondary current is induced in the metal to be melted situated in a crucible and outside of the core through which the primary current passes. There is no arc or resistance member,

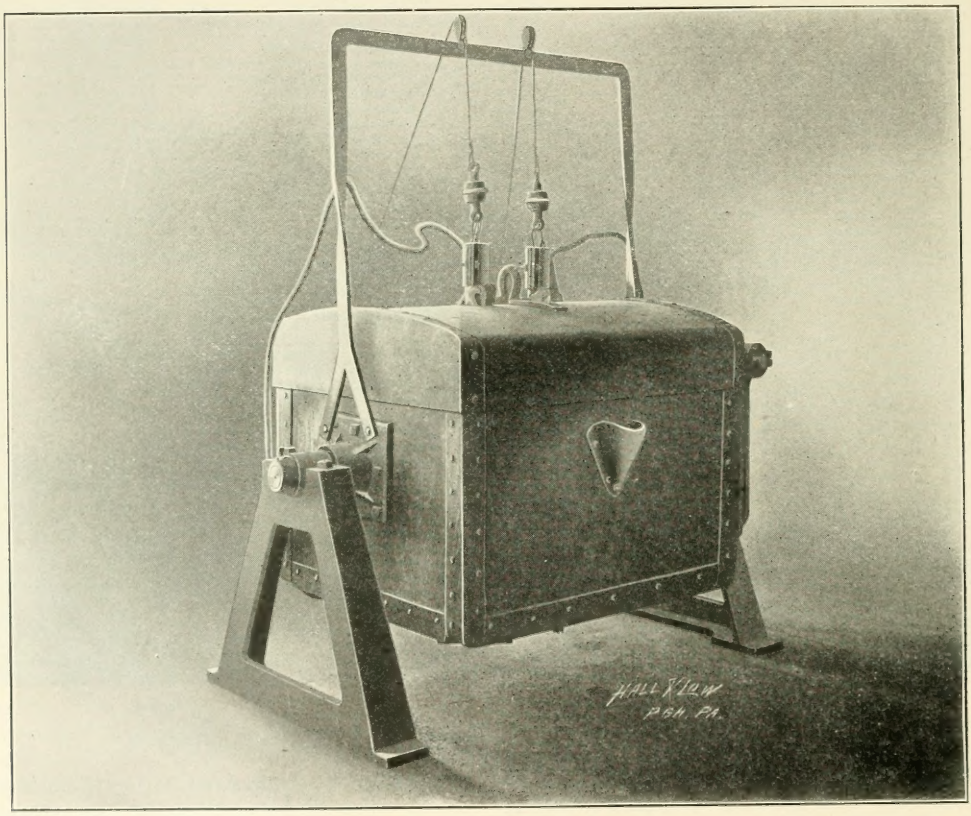


Fig. 2. The "Wile" Tilting Electric Furnace for Small Brass Foundry Work.

and no products of combustion, and in addition the melting of the metal may be watched with the naked eye. In principle, this furnace is the most attractive of any of the three types, but practical difficulties have prevented its use in any but a large way. Unfortunately, the space in which the metal must be melted is in the form of a circular slot and this slot varies with the size of the furnace. In a furnace capable of melting 100 lbs. of metal, it cannot be over an inch or two so that the shape of the metal melted must conform to it. This is a serious objection and has prevented the adoption of the furnace for non-ferrous metal work.

other existing kinds. This furnace is the invention of Raymond S. Wile, general manager of the company, and who originally constructed a stationary furnace for smelting tin-drosses. It proved so successful that the application has been made to other lines of work, such as the melting of brass, scrap metals, cyanide slimes and silver. Tin-dross is an exceptionally refractory material and the high heat obtained in the furnace resulted very favorably so that furnaces have been in use for some time in Connellsville, Pa., working upon this material.

The furnace which is the subject of this article is a combination of an arc and resistance

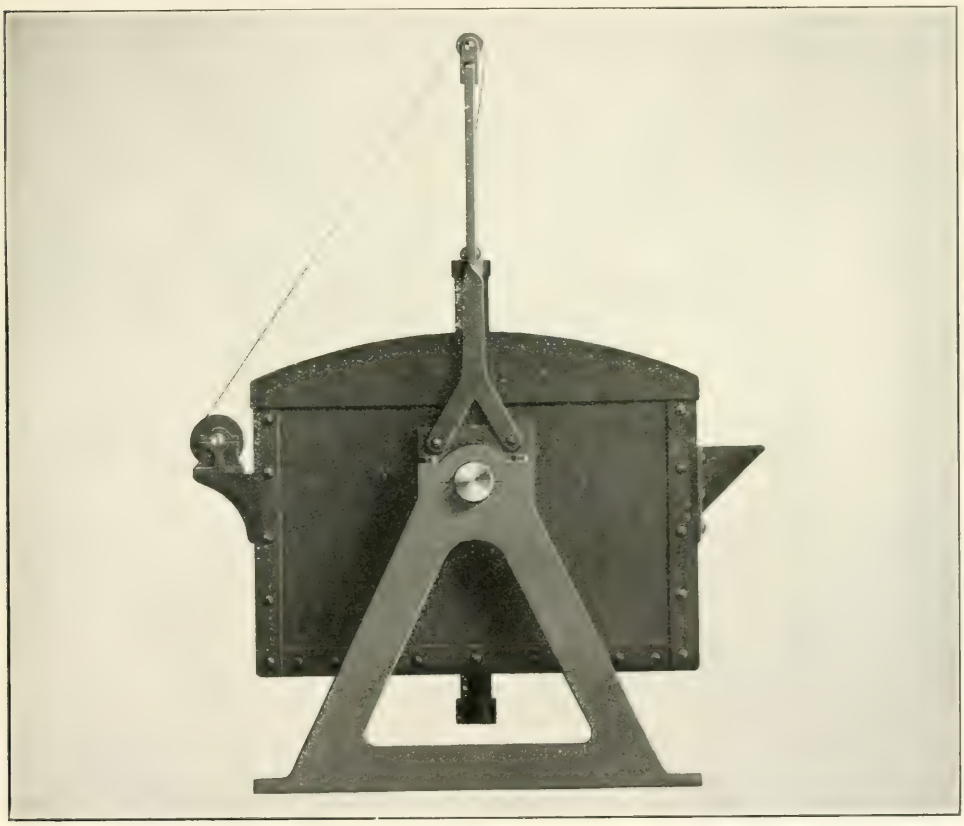


Fig. 3. End View of the Tilting Furnace.

A new type of furnace has recently been placed on the market by the Pittsburgh Electric Furnace Co.* which is new in principle and possesses certain marked advantages over

*Pittsburgh Electric Furnace Co., 004 Manufacturers Building, Pittsburgh, Pa.

furnace and in this respect is unlike any other constructed. It has been designed primarily for smelting scrap metals, melting brass, bronze and other non-ferrous alloys, and also for melting cyanide slimes, a use which has proved very satisfactory. If the reader will refer to Fig. 4 in which a cross section of a

furnace is shown, the principle upon which it works will be understood. The following will serve to explain it:

Four carbon electrodes are used. Two pass up through the bottom of the furnace and the other passes down through the top. The furnace is made either in stationary or tilting types and the principle of both is identical. To begin melting, the furnace is partially filled with broken *glass* and the two carbon electrodes arranged so that they almost touch. In this manner an arc is formed which soon melts the glass in its neighborhood. Now comes the singular part of the operation. As the glass melts, it becomes a conductor of the electric current, where before melting it was a non-conductor. The electrodes are now drawn apart so that the current passes through the molten glass and finally the whole charge of glass becomes molten, and as it becomes hotter, as fluid as water. The electrodes are moved farther apart and the glass is kept fluid by this means as the resistance offered to the passage of the current by the glass serves to heat it and maintain it in a molten condition. Up to this time no metal is put into the furnace, but the work is done upon the melting of the glass and maintaining it in a fluid condition.

When the glass has been melted and is in a sufficiently fluid condition (as fluid as water), the metal to be melted is charged directly on top of it. The initial heat of the glass melts the metal and it then, on account of the very fluid condition of the glass, immediately sinks to the bottom of the furnace. The glass above it completely protects it from oxidation so that the loss is reduced to a minimum. The use of the glass, it will be appreciated, constitutes one of the essential features of the furnace. It serves two purposes: First, to supply the resistance material for heating the charge. Second, to act as a covering for the molten metal and thus protect it from oxidation.

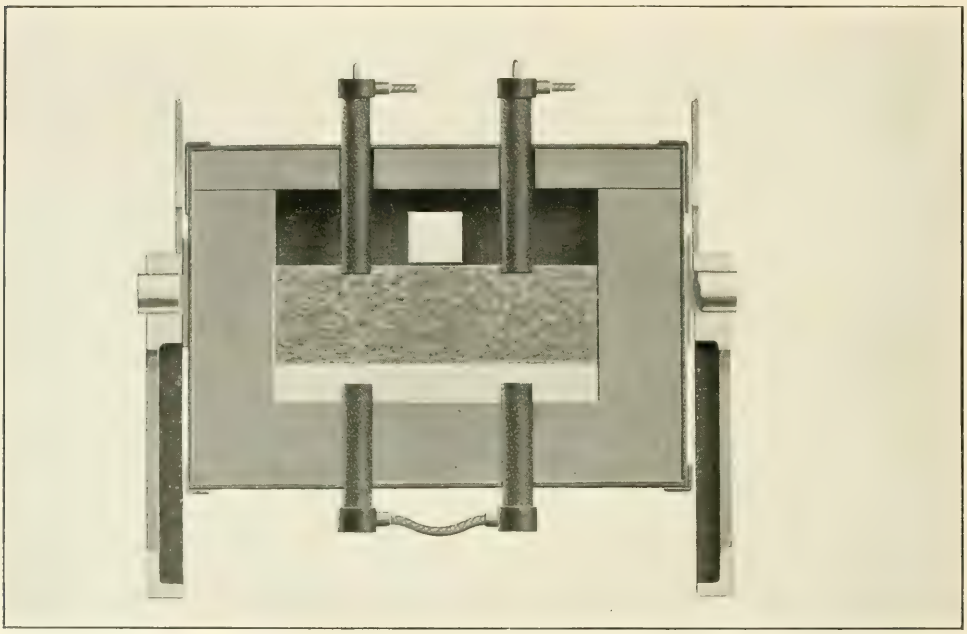


Fig. 4. Front View of the Furnace in Cross-Section.

Although the glass is so essential to the furnace, it can be obtained very cheaply and there is no need of any particular kind. It may be made, if desired, from soda-ash and sand, but this is hardly advisable for the reason that broken bottles are so readily obtained that their cost is almost nothing. In addition to the cheapness of the glass is the fact that the charge in the furnace lasts for several months of continuous run, and when it has become necessary to use a fresh charge, it is simply poured off or tapped off (in a stationary furnace) and a new charge put in.

The furnace has been made in two different types: The stationary and the tilting. In Fig. 1 is shown two furnaces of the stationary type that were erected in Connellsville, Pa., for melting tin drosses and slags. For large melts this type of furnace is to be recommended. For smaller melts, the tilting furnace is advantageous. The same furnace is used for smelting drosses, brass, silver or cyanide slimes. There is no charge necessary for any kind of melting.

The furnace itself is built of fire-brick, but the lining must be sufficiently refractory to stand the heat and corrosive action of the molten glass and metal. It has been found that a chrome fire-brick answers the purpose better than any other yet tried and it is with such material that the furnace is lined. Not only is chrome fire-brick refractory and non-corrosive, but it stands sudden changes of temperature well. This is an important feature in using a furnace intermittently as the constant cooling and heating which take place bring on strains from the expanding and contracting of the fire-brick when in use which cause ordinary fire-brick or even a magnesia brick to crack. The chrome fire-brick seems to stand these sudden changes remarkably well.

The electric current used with the furnace may be either direct or alternating, and either 110 or 220 volts may be used. The 220 volts is a little more advantageous for the reason that the charge of glass melts more rapidly at the beginning, but after started, the 110 volts current gives practically as good results. The electrodes are made of carbon and are readily obtained.

The tilting furnace is indicated in Fig. 2 and has the same melting arrangement as the stationary type, but the furnace itself is made to tilt to allow easy pouring. For smelting drosses, melting scrap metals, etc., the stationary furnace is preferable as it allows larger quantities to be treated. The tapping is readily done. The method usually followed in plugging an iron cupola by means of a wad of clay, can be used, but it has been found more expedient to place an iron bar in the tap hole as this effectually prevents the metal from running out. To tap the furnace, the bar is pulled out.

The stationary furnaces are constructed up

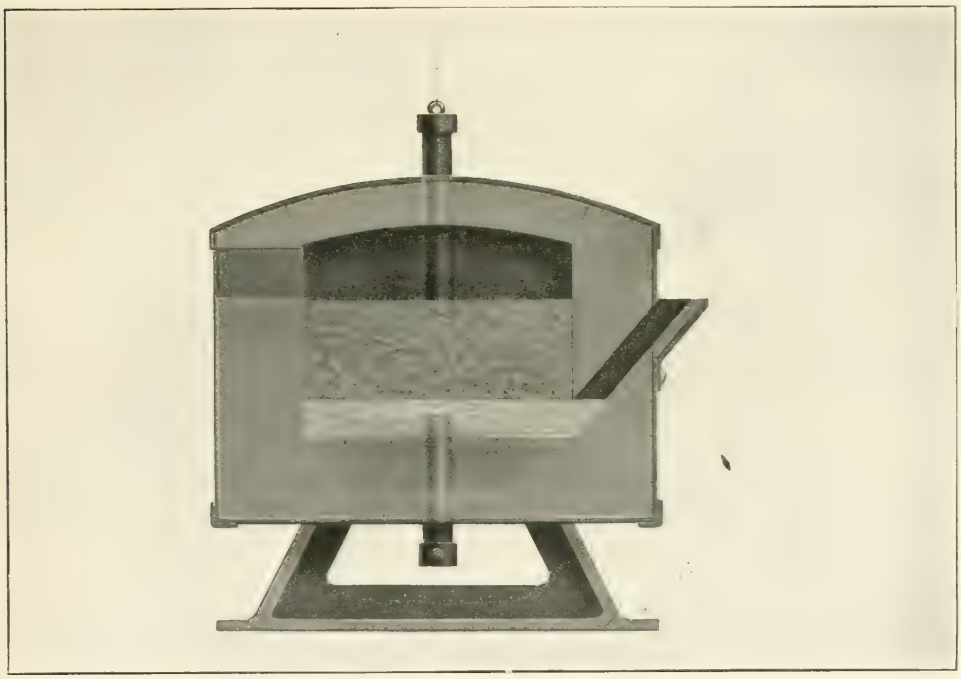


Fig. 5. Side View of the Furnace in Cross-Section.

to 20 tons capacity, while the tilting types are at present made up to 1000 lbs. for a charge. Larger furnaces of the tilting type are to be made, however, so that a greater quantity of metal may be melted. In case small furnaces (even large ones can be so coupled) are used, and the voltage of the current is sufficient, two may be connected in series and a corresponding economy in current obtained. The temperature of the molten glass in the furnace may be made to rise to 5500° F., but the pouring temperature of brass is about 2150° F., so that it will be realized that brass melting does not tax the capacity by any means.

A 200 lb. furnace containing this charge of brass, will consume about 22 kilowatts of current at 100 volts. By connecting in series a higher voltage can be used, or the current can be cut down by a rheostat, or a larger furnace can be employed. The 200 lb. furnace will pour this weight of charged metal about every half hour. A 500 lbs. furnace takes 32 kilowatts, and a 1000 lbs. furnace consumes 44 kilowatts of current. The 1000 lbs. furnace will pour a ton of brass every hour, and if run continuously will consume about 68 kilowatts in doing it.

Assuming that the furnace is not run continuously and that electric current can be obtained for 2 cents per kilowatt, it has been found that the current cost for melting 1000 lbs. of brass will be $1.36. This it will be appreciated, is somewhat higher than can be obtained in melting with oil or coke, but the waste in melting is less which more than compensates for the extra melting cost. The price of 2 cents per kilowatt for current may be high for some localities, but central stations usually make a low price for a day load and it is possible in most of the large cities to obtain current, (in case quantities are used) at about this figure. If not, the cost may readily be calculated by taking the price and multiplying it by 68.

The waste in melting metals by means of this furnace is low for the reason that they are continually covered with the slag of molten glass which protects them from oxidation. In melting dirty brass scrap, such as sweepings and grindings, the loss has been kept as low as 1-1/3 per-cent. This, of course, is on the actual metal in them for the reason that the dirt goes into the slag. The loss on new metals has been kept as low as 0.33 per-cent.

The value of the furnace in melting scrap will at once be appreciated when the loss is taken into consideration. From actual tests it has been found that with a cost of $3.30 per ton, dirty scrap can be melted with a loss in metal of 1-1/3 per-cent. The metal is at all times protected from the air and no oxidation takes place, so that allowing it to remain in the melted condition for a length of time will not cause a loss. This furnace, therefore, will appeal to those who have to melt or refine scrap metals.

Reducing the Cost of Nickel Plating Sheet Steel Goods.

In the majority of instances, the reason that sheet steel is used in the manufacture of hardware novelties, household goods, and similar lines of wares, is that it is cheap. Were it not, brass would be used in its place as it is much easier to work. The greater proportion of these wares is nickel plated, and it is the desire of the manufacturer to keep the cost of making the goods down as low as possible. The price at which the goods are sold necessitates such a cost reduction, otherwise the maker cannot compete with other manufacturers. It is always desirous of obtaining as good a finish as possible on the goods, and yet not have it bring the cost up to any amount.

It has been found in a number of instances that manufacturers, or jobbing platers who do the work for manufacturers, unnecessarily increase the cost of plating the goods by attempting to "cut down" the steel itself. To be sure, it is a rule of plating, that to obtain a good surface on a deposit after buffing, the base metal must have a suitable surface. In the manufacture of cheap work, however, such as hardware novelties, one would hardly expect to obtain as fine a finish as that produced on steel surgical instruments or nickel plated cutlery. It is for this reason that labor cannot be wasted in "cutting down" the steel previous to plating.

A method now followed by many platers who are obliged to nickel plate such sheet steel goods, is to nickel plate them without "cutting down" the steel at all. To be sure, if the steel is rusty, or there are burrs or fins on it, then this may have to be done, but as a usual rule, with the good grades of cold-rolled steel now obtainable, and with good press work, these operations are generally unnecessary.

The steel is nickel plated so that a *heavy* deposit is put on. This is the secret of the process. A five or ten minute deposit will not answer as this cannot be buffed to a good finish. This is the mistake usually made. Platers cut-down the steel and then give a light nickel deposit. It will not have the effect of giving a good heavy deposit and then buffing. The use of a heavy nickel deposit is all that is required. When this is done, it can be buffed to a high finish that will have a "color" and lustre that will far surpass in appearance and durability that formed by "cutting-down" the steel first and then giving a light nickel deposit. In the latter instance, the light deposit is buffed off, unless considerable care is used.

A heavy nickel deposit means from 1 to 1½ hours and this will be found cheaper than "cutting down" the steel, while the results are also better. The mistake usually made, therefore, is not giving a sufficiently heavy deposit of nickel.

Gas Furnaces in Sheffield, England.

An interesting innovation in the metal industry is the introduction of gas as a substitute for coal in the heating, hardening, and tempering of cutlery. The old-time coke-fire hearth and the more modern coal-fire oven furnaces are being rapidly supplanted in the various handicrafts of Sheffield by the gas-heated furnace. During the last three years more than 400 such furnaces have been installed in this city, and the indications are that such may probably become the usual heating method.

The chief advantage of coal-gas-fired furnaces is that they insure uniform heat and are consequently valuable for all processes requiring temperatures well under control. It is also held that they are cleaner in working, occupy little space, and are much lower in fuel cost than when coal or coke is used. The variety of purposes for which the furnaces are being used is somewhat remarkable, and these are extending as the result of experiment. The principal manufacturing silversmiths employ them for annealing silver and German silver, molding Britannia metal, and melting German silver. In the steel trade their purposes include forging, hardening and tempering edge tools, machine knives, table blades, files, high-speed drills and tools, wire, small crank shafts, also for heating railway springs, for punching and fish plates, foundry work, etc.

A still more important field for gas heating has been found in furnaces for annealing high-speed or carbon crucible steel. For this purpose a large furnace, 16 feet long, has been installed in Sheffield which is giving excellent results, and not only saves working expenses, but gets rid of a considerable emission of black smoke, which can not be avoided when such processes are coal fired. The gas consumption of the furnace referred to is only 2,000 cubic feet per hour. For heating the baths of lead and salt in which some classes of steel are now hardened, gas furnaces may be obtained whose efficiency has been fully established. An apparatus of this kind in the Sheffield United Gas Light Co.'s showrooms heats various mixtures of salt in crystalline form to any temperature up to 1,000° C.

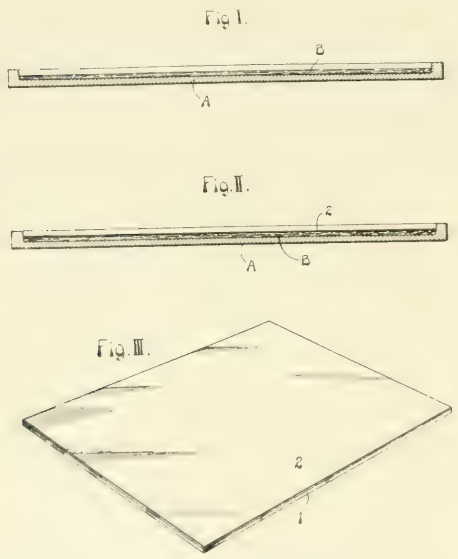
The pressure from the company's mains suffices for all the processes mentioned, but the furnaces may be fitted with air-blast apparatus for producing higher temperatures. The consumption of gas per furnace in Sheffield ranges up to 5,000 cubic feet per hour. Several noted firms which were pioneers in gas cooking have lately given attention to the production of furnaces suitable for almost every conceivable requirement of the metal trades.

An important factor in the development of gas heating in the Sheffield trades has been the cheapness in the local supply of that commodity. For industrial purposes the manufacturers can, in fact, command the cheapest gas in the country. For engines the price is only 22 cents per 1,000 cubic feet, and for other purposes 30 cents, with a reduction to 26 cents if the annual consumption exceeds 500,000 cubic feet. Any consumption exceeding the latter total is charged at 22 cents.—*Daily Consular Report.*

Monel Metal is now being made in the form of nails, tacks, screws, rivets, washers and other forms of hardware. The nails and tacks can be driven like steel. Sheets and hardware are used for roofing and marine work. The metal stands weather conditions admirably as it is composed of 67 per cent of nickel. The United States Government is now an extensive user of this material.

Making Compound Britannia-Metal Sheet.

The increase in the price of tin has been instrumental in bringing out a new process for the manufacture of a compound sheet of a tin alloy backed up with one of lead. Britannia metal sheet is extensively used in the manufacture of soft metal goods, such as hair brush backs, trays, tea-pots, sugar-bowls, ladles, medals, coffin-plates, etc. The object of using britannia-metal (consisting of tin, antimony and copper) is that the excess of tin in it gives it a non-corrosive property, while the natural softness of the metal allows it to be worked into all sorts of shapes without annealing. It is just about hard enough to hold its shape.



Tebbett's Method of Making Compound Lead and Britannia Metal Sheet.

For some time, the Hoyt Metal Co., of St. Louis, Mo., have been manufacturing a compound sheet metal for use in the aforesaid articles and which greatly cheapens the cost. The sheet is made by rolling in the usual manner, but the ingot from which it is made is composed of two distinct alloys. The outside, or that which is to be exposed to view on the article, is composed of britannia-metal or similar tin base alloy, while the back is made of a lead alloy, such as, for example a lead and antimony mixture. The process is the invention of Lewis B. Tebbetts 2nd, of the Hoyt Metal Co., and a patent was recently granted upon the method of making the compound ingot. The inventor describes his process as follows:

"In carrying out my method, I first melt the base metal and place it in a molten condition in a suitable open face mold, such as that indicated by A in the drawing, the molten base metal being designated B. After skimming the dross or bubbles from the top of the base metal, I place on said base metal, while it remains in a molten state, an unmolten body of facing metal, said facing metal being preferably in the form of a rolled sheet. The facing body floats on the surface of said molten base metal until it has become fused thereto and, after fusing, remains at the top of the base metal until both layers of metal have become cooled, without either metal entering appreciably into the texture of the other metal, and without either layer of metal losing its identity.

By carrying out my method, I produce an ingot or slab of composite metal, comprising the base layer 1 and facing layer 2. This ingot is utilized to produce the composite metal plate by rolling it to the desired thickness between suitable rolls.

My method provides for the production of composite metal plates that may be used for various purposes, one of the important uses of such a plate being the furnishing of a metallic body having a face that may be readily operated upon by engraving tools and one that is much more desirable in this connection than that furnished in a solid homogeneous metallic plate, for the reason that an alloy exactly suitable for the operation of engraving tools therein is supplied without the necessity of its containing a stiffening metal through which the engraving tools will not readily cut. It is also obvious that a composite metal plate made in accordance with my improvement has many other uses, as it is highly desirable in making utensils, metal ornaments, novelties, and other articles into which an inexpensive base metal may enter and a finish therefor be provided by the layer, or layers, of facing that enter into my composite plate."

The temperature of a gold plating solution determines, to a marked degree, the color of the gold deposit. Hot solutions give red shades while cold ones produce a yellow or pale color.

Etching and Piercing Metals by the Transfer Process.

The difficulty in etching metals lies in applying the so-called "resist" to the metal to be etched. When this resist has been applied, the method of etching is the same by all processes, whether it be by the so-called "rubber stamp", transfer, "painting-on", or photographic operations. The "resist" is used to protect the metal that is *not* to be etched and then, when it has been applied, the exposed or metal unprotected by it, is eaten away or dissolved away by a suitable solution. This solution may be anything which will attack the metal and not the resist and is usually adapted to the kind of process. Some resists will not stand strong acids, and mild chemicals,

Fig. 1. The Black and White Sketch on Paper, Used as the Starting Point.

like perchloride of iron have to be employed; but this part of the operation has no bearing upon the general aspect for the reason that the final result is the eating away of the exposed metal.

There are a number of different kinds of etching processes;

1. The rubber-stamp process*. This is the cheapest of all processes and is not capable of producing fine and sharp results. It is employed for etching names and trade marks upon steel knives and is limited to small work. Essentially the process is as follows: The steel knife blade is coated with a varnish made by dissolving gum-guaiacum in alcohol. A rubber stamp is then stamped on a cloth pad moistened with a strong solution of caustic potash. The letters on the rubber stamp take up a little of the potash solution, just as they do in using an ink stamp-pad. The stamp is then pressed down upon the surface of the gum-guaiacum varnish on the knife blade. Potash has the property of dissolving gum-guaiacum so that the imprint of the rubber stamp in potash dissolves away the varnish and exposes the steel. The surface is then washed and dilute nitric acid applied which etches the steel where exposed.

2. The "painting-on" method.* This is the most expensive of all processes and each separate article, upon which the design is to be etched, must be treated separately by hand. The method, however, is the simplest of all and consists in painting the design to be etched on the surface of the article. Asphalt paint or other suitable substance is employed and the design is painted on by a brush. The paint resists the action of the etching solution afterwards employed. The figure painted on the surface is left after etching in raised or

Fig. 2. Black and White Glass Negative Made by Photographing the Sketch in Fig. 1.

the so-called "relief" design. The etching is carried on by nitric acid, perchloride of iron, or electrolytically, according to the metal to be etched or the desire of the operator. It will be seen that the fact that each separate surface must have the design painted on by hand, brings the cost high, and for this reason this process is employed only for exclusive or individual designs. Neither is it capable of giving the fine detail and sharp character that can be obtained by the transfer or the photographic processes.

3. The "transfer" process. This is a

*Described in THE BRASS WORLD, Feb. 1908, page 47.

*Described in THE BRASS WORLD, Sept. 1909, page 311 and May, 1910, page 193.

method extensively used for the best class of work, although it is not capable of giving the fine and sharp detail that can be obtained by the photographic method. It has, however, the advantage that it can be used on curved or irregular surfaces where the photographic method cannot be employed, and in addition, it gives a resist that can be used with quite strong acids and which is so resisting that the metal can be pierced by the etching liquid. The photographic method necessitates the use of a bichromated gelatine or albumen film which is readily attacked by acids, and perchloride of iron is necessary for the etching solution with its accompanying slowness.

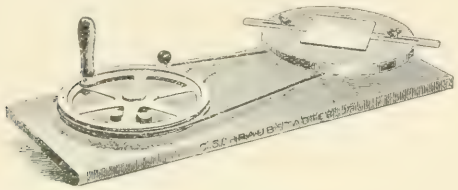


Fig. 3. The Whirler for Coating the Steel Plate Evenly

4. The photographic process. This process is extensively employed in the manufacture of printing plates, such as the so-called "half-tone" and "line-cuts." It is also largely employed for the manufacture of name-plates. It is limited to flat surfaces. The metal to be etched is coated with a sensitive solution of albumen or gelatine containing bi-chromate of potassium or bi-chromate of ammonium. The design is photographed on a glass negative so that the whole will be black and white. The blacks must be absolutely black and opaque and the whites absolutely clear glass. The wet-plate process is used for producing this negative as it gives these qualities. This negative is made on thick glass and is employed continuously. The metal plate is coated with the sensitized solution and printed under the negative in a printing frame in the sunlight, diffused daylight or by electric light. A few minutes exposure is given it. The plate is then treated with warm water which dissolves off the portions that have *not* been exposed to the light and leaves those which have been exposed untouched. In this manner the bare metal is exposed in the portions desired and may be etched with perchloride of iron or other suitable solution. Certain other operations are followed after the washing-out in order to strengthen the resist, but they do not concern us here.

The objections to the photographic process are that it can be used only on flat surfaces, unless a curved negative is employed. Films of celluloid are sometimes used on this account. The other difficulty is in the resist. The sensitized solution employed for coating the plate is not as resisting as one might believe and solutions of a mild nature, such as perchloride of iron, must be used for the etching in order to avoid lifting the resist during the etching operation. The etching, therefore, is quite slow. The advantage of the process is that it is rapid, when suitable apparatus is had, and is capable of giving the finest and sharpest detail not obtainable by any other process. It will give the sharpness of a photographic print and those who are familiar with photography well know that scratches and dust may readily be reproduced.

What the "Transfer-Process" Is.

The principle of the transfer-process is as follows: A die-plate (or master-plate) is first made. The plate itself is made of hard steel and is usually rather thin. A favorite sheet steel for this purpose is a saw-plate and pieces of such sheet may be cheaply purchased from hardware dealers and in such a trade

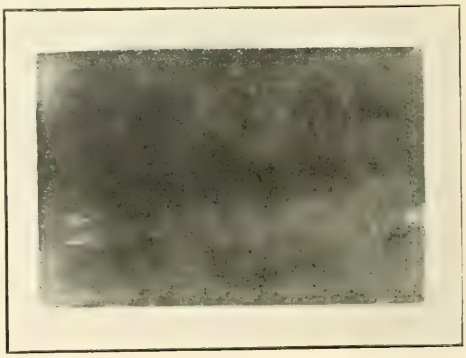


Fig. 4. The Hard Steel Saw-Plate Coated With Asphaltum.

they are known as "scrapers" being employed by cabinet makers, painters etc. They are simply pieces of saw-plate, hardened and ground. The surface, however, is rather rough and requires extra polishing to obtain the smooth surface necessary. This, however, is easily done by any concern doing polishing.

The fact that a saw-plate is used for the die-plate has been instrumental is giving the name of "saw-plate" etching to the transfer

process. It is also the process used for etching the design on a saw blade and those who wish to investigate the method should look at a good saw, such as a hand or cross cut saw and the kind of etching possible by the process can be appreciated.

The plate used for the the die-plate must be hard so that it can just barely be touched with a file or, better still, cannot be touched. Soft steel, brass, copper or other soft metals will *not* answer. The reason for this is that the surface of the plate is constantly scraped by a scraper of hard steel (like a putty-knife) and a soft metal plate would be gouged out and scratched in the operation.

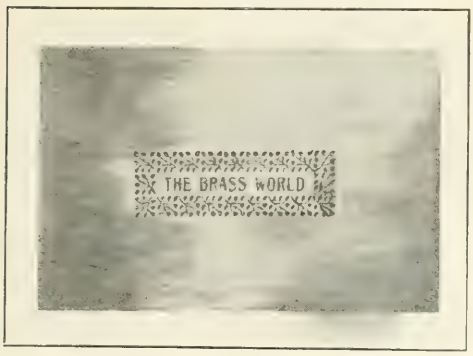


Fig. 5. The Hard Steel Saw Plate with the Design Etched in.

The design to be transferred (and subsequently left in raised or relief figures on the etched surface) *must be sunk* in the die-plate. Raised designs cannot be used. This point, however, is readily adjusted in making the plate as will subsequently be explained. The design, sunk in the steel plate, is then filled with transfer wax, by means of a scraper (a putty knife will do) and the surface of the plate scraped off leaving the design in the plate completely filled with wax. A piece of tissue paper, known as "transfer paper" is then pressed down on the plate and, after squeezing down well, is pulled up by hand The wax sticks to the paper in the form of the design.

The paper having the design upon it is then pressed down by the hand upon the surface to be etched so that all parts come in contact with the metal. The paper is then wet with water and again pulled off by the hand. The wax is left on the surface of the metal in the form of the original design and of a thickness sufficient for resisting the attacks of the etching solution. The etching is now performed by immersion of the article, upon which the design has been transferred, in nitric acid or other suitable solution. The design is left in relief (raised) and the metal dissolved or eaten away around it. The length of time in the etching solution determines the height of the design.

Making the Die Plates.

The making of the die-plate for the transfer process is the critical portion of the operation. The actual transferring may be done by unskilled or inexperienced labor. The die-plate is used continuously and if made of hard steel will last many years. It is not infrequent to find a plate that has been in use for ten years. The hardness of the plate allows it to be used without appreciable wear.

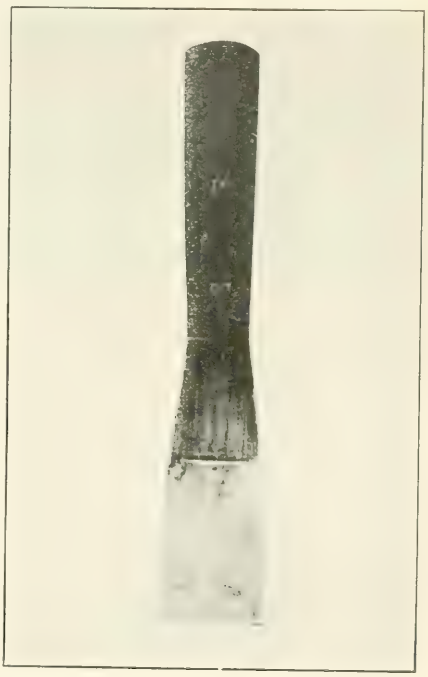


Fig. 6. Scraper Used for Scraping off the Steel Plate.

As previously mentioned, the die-plate is made of hard steel and a piece of a hand-saw blade is an excellent material as it is already hardened and ground flat, although not polished. The polishing can be done without difficulty. *It is absolutely essential that the die plate shall be hard.* A soft steel plate may be used a few times but after this it will be ruined.

The design to be transferred must be sunk in the plate, or as it is called "intaglio." The sinking of the design in the plate may be accomplished by several methods and each of which is used:

1. By cutting or engraving the design in the plate. This necessitates the use of a soft plate and afterwards hardening it. The whole plate may then be hardened and the temper drawn, or it may be case hardened. The hardening of the plate clear through requires that it shall be thick in order to avoid warping. Case-hardening is preferable although care is required in this method. By either process, the plate is finally obtained with the design sunk and in a hard condition.

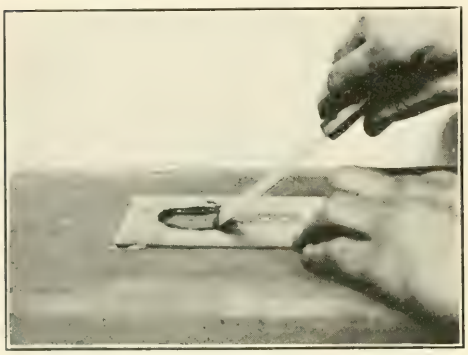


Fig. 7. Scraping Off the Excess of Wax with the Scraper.

2. By stamping in the design. This method is now and then used for coarse work. The plate then requires hardening.

3. By coating the plate with wax and cutting through or engraving the design. The steel is then laid bare and the design is etched in with nitric acid (1 part of acid to 4 parts of water). A hard steel plate can be used and this method is employed for certain classes of work. The cutting through of wax, however, requires skill and the method is not capable of giving as good result as the subsequent one (the No. 4 or asphaltum method).

4. The best method of making the die-plate is as follows: The flat and smooth steel plate (and hard), such as the saw plate previously mentioned, is coated with an asphaltum solution, and exposed to sunlight. The asphaltum is then treated with oil as will be described and the unexposed portions dissolved away so that the bare steel is left. The plate is then treated with dilute nitric acid which sinks the design in by dissolving the steel away. The portions of the asphaltum which were exposed to the light were not dissolved by the oil so that they remained on the plate as the resist. The process is carried out as follows:

Making the Negative.

The first thing to do is to make a drawing of any desired design. If the design is to be sunk it must be in white. As making a white sketch or drawing is not easy, the best method is to make a black and white drawing or sketch and then have a photo-engraver make a reversed print. In the design (Fig. 1) illustrated in this article, this was the method followed. The words "The Brass World" and the border, were drawn in black and a photo-engraver made a reversed print which was the beginning of the process. Letters and words should read the regular way in the print as will be seen. The design to be used is shown in the form of a print on white paper in Fig. 1.

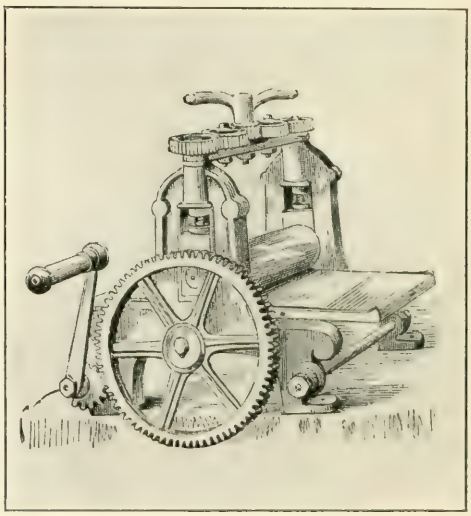


Fig. 8. The Transfer Press or Roller.

The next operation is to make a black and white glass negative by the photographic process of the design print shown in Fig. 1 The negative must be in black and white and without half-tones. The clear glass in the whites must be absolutely clear and the blacks must be really black and quite opaque so that no light can penetrate. Unless such a negative is obtained, the making of the die-plate will not be successful. The best process for this is the so-called "wet-plate" which few

but photoengravers now use. The simplest way is to let a photo-engraver make such a plate and he will do it at a small cost. The so-called process dry plates may also be used and the negative herewith shown and used was made by such a plate. These plates give clear glass and do not fog like a rapid plate Even with them, however, considerable experience is required in order to obtain a satisfactory negative. The print is exposed in the usual manner in front of a camera and with a lens giving sharp definition. With the ordinary process plate, an exposure of about 30 seconds with f/16 stop is required. The negative is then developed with a hydrochinon developer (for clearness, until the shadows just begin to veil.) The plate is then fixed and washed. If, after fixing, the shadows are not clear glass, then reduce with a reducing solution until they are. Very little reducing must be done or the black will be reduced too much. The plate must then be intensified or the blacks will not be sufficiently opaque. The best intensification for this purpose is the so-called lead intensifier as it gives more density and opacity than other intensifiers. This solution is made as follows:

Solution No. 1.

Water ..... 1 oz. or 1000 c.c.
Red Prussiate of Potash 30 grains or 60 grams
Nitrate of Lead ..... 20 grains or 40 grams
Acetic Acid ..... 10 minims or 20 c.c.

Solution No. 2.

Water ..... 10 oz. or 1000 c.c.
Sulphide of Ammonia .... 1 oz. or 100 c.c.

The negative, well washed from fixing solution, is immersed in Solution No. 1 until it is completely whitened. It is then washed thoroughly and immersed in Solution No. 2 until blackened clear through.

The negative thus obtained and shown in Fig. 2. will be clear in the shadows and black and completely opaque in the high lights. This will give a satisfactory quality. The negative thus obtained is used for printing on the steel plate coated with asphaltum. Unless it is clear in the shadows and perfectly opaque in the high lights it will not do. Ordinary dry plate negatives that have not been intensified and are somewhat transparent in the high lights, will allow light to pass through when exposed to the sun and thus spoil the asphaltum. A negative that might be excellent for photographic purposes of the ordinary kind will not answer on this account.

Coating the Steel Plates.

The asphaltum used is ordinary asphaltum of commerce and occurs in black lumps. Some grades are known as bitumen and are usually a little better than the others, but almost any kind may be used. The lumps resemble coal although not quite so black. They are broken up and dissolved in *benzol*. Benzine (or gasoline) will not do as asphaltum is insoluble in it. The amount of asphaltum dissolved in the benzol should be enough so that when flowed over the plate, a transparent, brownish film is produced. The solution of the asphaltum takes place in the cold and when all dissolved, it should be filtered with cotton or paper in order to remove impurities. Keep in a corked bottle away from the light.

The steel plate is cleaned from grease and made slightly matt or dead by means of emery flour. A highly polished surface is not desirable as the asphaltum is more apt to flake off. The finest emery powder is employed and the surface is scoured with it while wet. In this manner a clean surface is obtained. The asphaltum solution in benzol is then flowed over the surface (never brushed) so that an even coating is obtained. When right, it will be brown, but the steel can be seen through it. If black and thick it is too heavy and will not print readily.

The coating of the plate by flowing over the solution can be done by experienced hands, but it is a little difficult to obtain an even coating so that it will print uniformly. If thicker in one portion than another the printing will be uneven so that care should be taken to obtain as uniformly thick coating as possible. A "whirler" is excellent for this purpose and is shown in Fig. 3. The plate is spun around by it and a small quantity of solution then poured on, after which it distributes itself evenly. When flowed on by hand, the benzol evaporates so rapidly that the asphaltum is apt to be left in layers or ridges.

When the steel plate has been coated with the asphaltum it has the appearance shown in Fig. 4. It is left to dry a few minutes and then is ready for printing under the negative.

Printing the Plate.

The glass negative, shown in Fig. 2, is placed in a printing frame used in photography with the steel plate on it, just as a paper print would be used. The two, however, are clamped tightly together so that the surfaces come in contact completely. The frame is then ex-

posed to the *direct* sunlight. The printing will not take place on a dark day or in the shade, but needs the direct sun. The time need not be exact as long as sufficient, and usually from 5 to 8 hours are required.

Developing the Coated Steel Plate.

There are two methods used in developing the plate so as to remove the asphaltum not acted upon by light and leave the steel bare for etching:

1. By means of turpentine. This is an old process and the plate is laid in a tray and turpentine poured over it. Asphaltum that has been exposed to the light a sufficient length

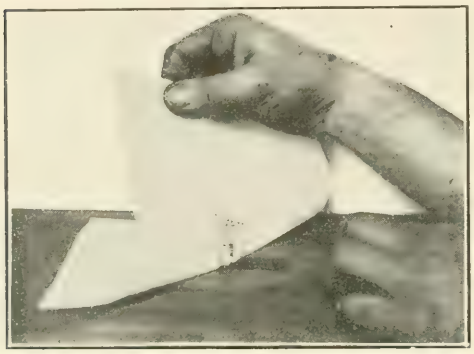


Fig. 9. Pulling the Transfer Paper From the Plate.

of time is not soluble in turpentine, so that the parts that have been acted upon by the sunlight are not dissolved while the others are. When the plate is put into the turpentine, the unacted portions of the asphaltum will, within a few seconds, be dissolved away. Then remove the plate and flow water over the surface to wash away the excess of turpentine. The final or last traces may be washed away by flowing gasoline over which will not dissolve the asphaltum. The plate is then ready for etching. Of course, it will be necessary to inspect the plate and see if everything is all right before applying the etching acid or the steel may be ruined. If the design is sharp and the steel exposed evenly all over, then the etching can be carried out.

2. By means of oil. Ordinary machine oil (lubricating oil) answers the purpose. The oil is rubbed on the surface of the plate with a tuft of cotton. Very little pressure is used. The plate is then warmed slightly when it will be found that the asphaltum not acted upon by the light begins to soften and the design appears. Now allow the plate to cool and rub lightly with the cotton. The asphaltum will usually come off in the portions that have dissolved in the oil. If not, add more oil and warm again and rub lightly. Very little pressure should be used in rubbing. When completed, it will be found that the asphaltum acted upon by the light remains on the plate, and in the form of the design.

The excess of oil is now removed as much as possible by flowing water over the surface of the plate under a faucet. When this is completed, a thin film of oil is left and it may be removed by flowing gasoline over the surface (but not rubbing). This will not dissolve the asphaltum, but will remove the oil. When this has been done, the steel plate is ready for etching.

The No. 2 process is the best for developing the asphaltum and gives excellent results. Its use is advised in preference to the turpentine treatment.

Fig. 10. The Transfer Paper with the Design on It, Ready for Applying to the Article to be Etched.

Etching the Steel Plate.

The etching of the steel die-plate is carried out by means of dilute nitric acid. The best proportions are 4 parts of water and 1 part of nitric acid. This proportion works rather slowly but is safe and there is no danger of lifting the resist. A mixture of 2 parts of water and 1 part of acid may also be used and works more rapidly, but a good resist must be had to employ it. It may be said, however, that the ordinary thickness of asphaltum, obtained as previously described, will stand this 2 and 1 strength of acid all right. Its advantage over the 4 and 1 acid is that it works more rapidly.

The acid is used cold and is kept cold. If allowed to become warm or hot the resist is apt to lift off.

The acid may be poured in a small pool on the surface of the plate, or the plate placed in a dish of glass, porcelain or hard-rubber and the acid poured over it. The "pool" method is generally employed and a small ridge or dam of wax can be placed around the outside of the plate, if necessary, to keep the acid from running off. Before etching the plate, see that all portions that are not to be attacked by the acid are covered with asphaltum. The benzol solution containing it

Fig. 11. Pulling Off the Wet Transfer Paper from the Brass Surface to be Etched.

makes a good varnish and is painted on with a brush upon the parts that are to be protected from etching.

The acid will usually begin to act as soon as put on and minute bubbles of gas are given off. Usually one "pool" of acid is sufficient for etching to a sufficient depth, but if not, a second quantity may be poured on.

The length of time the acid is allowed to act will depend upon its strength, temperature etc. As a usual rule, from 5 to 10 minutes are sufficient. The steel should be etched sufficiently deep so that the edge can be felt with the finger-nail. This point is easily determined by pouring on the acid and trying. If not deep enough, pour on more acid and etch again. Too light an etch is not capable of giving good results, although it may look well and it should not be etched too deeply. The exact point can readily be determined by a little experience. When the etching has been completed, rinse off with water and then remove the asphaltum by rubbing with benzol or turpentine. The etched die-plate is now completed and has the appearance shown in Fig. 5 This plate, it will be noticed has the look of an engraved steel plate. The object of etching in the manner just described, however, is to allow a hard steel to be used.

The Etching or Transfer Wax.

The wax used for transferring (the transfer wax or ink) is made as follows:

Black Pitch ..... 1 part
Beeswax ..... 2 parts

Melt together and then add lampblack to color. Wet the lampblack with turpentine before adding. Cool the mass and see if it can be spread well. If too thick, melt and add a little turpentine to thin. When right, it should be like stiff putty, but spreads well under the knife or scraper. The lampblack is used to color it so that it can readily be seen on the plate and transfer paper.

The wax thus made is spread on the surface of the steel plate and worked down into the design by means of a scraper. A putty

Fig. 12. The Design Left on the Sheet Brass to be Etched After the Wet Transfer Paper Has Been Pulled Off.

knife is suitable, but the edge should be straight across and sharp so that the excess of wax may be scraped off. When the wax has been worked into the depressions of the design, the scraper is scraped across the face of the plate as shown in Fig. 7. In this operation, all the wax is scraped off except that in the depressions of the design. The object of the hard steel plate is thus seen. The knife or scraper is illustrated in Fig. 6 When completed, the wax is left in the design and the surface of the plate is clean. In order to accomplish this perfectly, however, the steel die plate must be flat and the scraper straight across its edge so as to correspond with the flat surface of the steel plate. The plate is now ready for transferring.

The Transferring.

The transferring operation consists in trans

ferring the wax in the depression of the design in the steel die-plate, to the surface of the article that is to be etched. This is accomplished by means of "transfer-papers." Such paper* is a special grade of tissue paper made for the purpose.

To transfer the wax, the paper is pressed down upon the surface of the steel die-plate in direct contact with the wax, and then put through a transfer or engravers press. This press is shown in Fig. 8 and consists of two

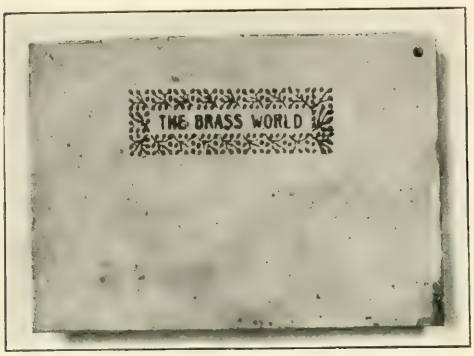


Fig. 13. The Brass After Etching But With Resist Still on the Surface of Letters.

rollers through which the plate and tissue paper are passed. The paper is placed upon the die-plate and over this a pad of felt is used to equalize the pressure. The whole is then put through the press and the tissue transfer paper becomes pressed down in intimate contact with the wax in the depressions of the design. The press is necessary for constant work, but for single or occasional work, the paper may be pressed down by hand. It must be rubbed down hard, however, in order to press the wax into the surface of the paper, so that when the paper itself is removed the wax will come with it.

The paper is now pulled off as shown in Fig. 9 and it will be found that the transfer-wax will have adhered to the paper as indicated in Fig. 10. The design, therefore, is on the paper in the form of the transfer wax of considerable thickness. Unless the design has been etched in the die plate of sufficient thickness, however, the wax will not be of the right thickness on the paper and when transferred to the surface of the metal to be etched it will not be of sufficient thickness to resist the etching acid.

The design now on the transfer paper is ready for transferring to the surface of the article to be etched. To transfer it, it is simply pressed down upon the clean surface of the article to be etched. The pressing down in this case, need not be hard and the hand is sufficient. All that is required is to bring it in contact with the surface.

When pressed down on the surface of the metal intimately, the paper is then wet with water and pulled off. Wetting allows the wax to be freed from the paper so that it will adhere to the metal surface to be etched. Water, however, is apt to leave the paper tender so that it will tear, and it is advised to use the following solution instead:

Water	3 parts
Alcohol	1 part

The paper is then left tougher and will not tear. It can then be pulled off as shown in

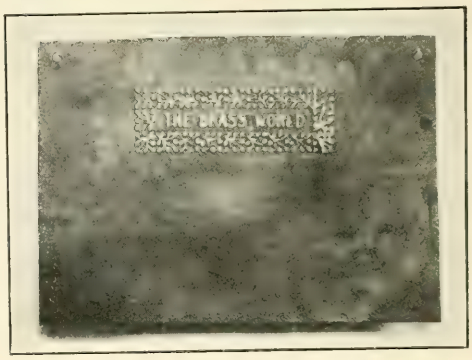


Fig. 14. The Article With the Resist (Transfer Wax Removed and Finished.

Fig. 11. The design is left on the metal surface to be etched as indicated in Fig. 12, and the etching can immediately be commenced.

The Etching Process.

The method of etching depends upon the metal. The advantage of the transfer process, however, is that a heavy coating of the wax is obtained upon the metal surface to be etched, and this acts as an ideal resist for even strong acids. In fact, it is so firm and resisting that with a good transfer, the metal may be pierced right through without difficulty.

For brass, copper, bronze, German-silver, sterling-silver, steel, iron, zinc, and similar metals, nitric acid diluted with water is recommended. The following proportions are advised:

*The paper can be obtained from Dennison Mfg. Co., New York City.

Water ..... 2 parts
Nitric Acid ..... 1 part

If, however, it acts too strongly, add more water. Care must be taken to keep the solution cool, either by the use of a quantity of the acid, or by other means. As the acid acts upon the metal, heat is generated which is apt to melt off the transfer wax.

Fig. 15. Etched Design on Circular Surface, Showing How the Transfer Paper Adjusts Itself to Such Conditions.

The length of time for etching depends upon the depth desired. A few minutes will give an ordinary etch. Five or ten minutes will give a deep etch. Other etching solutions such as a saturated solution of perchloride of iron, muriatic and chlorate of potash, or electrolytic etching may be employed, but they are slower than the nitric acid. Nitric acid is good and is to be recommended.

Advantage of the Transfer Process.

One of the advantages of the transfer process is that the design may be transferred either to a flat surface as shown in Fig. 14, or a curved one as indicated in Fig. 15. When applying to a curved surface the paper is slit to allow its conforming to the contour perfectly. One of the chief advantages of the process, however, is in the fact that a heavy resist is obtained on the metal to be etched so that strong acids or etching solutions may be used. In addition, the transfer may be made upon glass, marble, metal, ivory, or in fact any material that can be etched. The secret lies in the production of a good die-plate, and when this has been obtained, the etching is comparatively easy.

Red Brass Ingots.

By H. C. Parrock.*

Red brass ingots, properly made, offer the following advantages to the foundryman:

Uniformity
Known contents
Full value
Low shrinkage
Low handling cost.

Uniformity in ingots depends upon the stock, the amount of the charge, and the proper handling of the metals when melting and tapping. In this respect, the direct flame reverberatory furnace has advantages over the crucible. A charge of 50,000 lbs. melted at one time on a large hearth, though made up from a carload of various sorts of scrap, will yield a carload of ingots that show only a negligible variation throughout. This follows naturally from the nature of the process. Each ingot is, for all practical purposes, exactly like every other ingot.

In the crucible made ingot, the uniformity of ingots from the same lot depends to a large extent upon the ability of the man employed to pile and quarter; or to select by judgment and experience, with the usual liability of human error. The large furnace is free from this chance; which means that in purchasing a carload of ingots one analysis will show the foundryman what he is buying when taking the ingots made on one hearth in a large quantity, while in buying a carload made up in small lots, a 10% variation might result over the entire car. Such a variation would mean a possible loss in making one customer's castings or the shipment of poorer material on another order, to the customer's loss.

An analysis of a carload is best made by selecting six or more ingots at random, drilling, and mixing thoroughly, and analyzing the mixture, according to approved methods.

However, it is evident that the use of ingot of either method of manufacture is preferable to the purchase and use of promiscuous scrap. There is no way in which the foundryman can ascertain the exact quality of a barrel of scrap except by melting the whole lot, and analyzing the contents of each crucible. The small maker cannot do this economically. This is what the ingot maker does, taking his

*The Lumen Bearing Co., Buffalo, N. Y.

analysis before tapping, in order to correct the bath, if necessary, by the addition of new copper, tin, lead, or zinc. The product is then an exact one, and is uniform throughout. It is further evident that the ingot maker will purchase scrap to better advantage since he buys direct from the source of supply, and in larger quantities than the foundryman. He is in a position to select and so maintain the original quality of his raw material, an advantage to himself and ultimately to his customer.

Since the bath is tested prior to tapping, it is evident that the metal can be brought to exact formula (within reasonable limits.) A buyer may ask for any analysis he desired with a variation of 1% on copper, ½% on tin, with lead and zinc within 1%. Such an ingot is close to specifications and the best product obtainable. It therefore commands the highest price. He will then pay for this material on its analysis, or pay what he gets, at from three quarters to one cent under the metal market.

Or ingots may be ordered to read—

Copper	not less than	.....	82%
Tin	" " "	.....	4%
Lead	" more "	.....	7%
Zinc	" " "	.....	9%
Impurities	not more than		.75%
(including antimony)			

These ingots are sold at 1½c to 2c under the metal market or at a flat price, regardless of content, it being understood that the above limits be maintained. The ingot maker furnishes an analysis with his material: the foundryman checks this analysis by selection at random from the car. The contents thus determined show the foundryman with certainty, the material he is using. With this certainty he not only establishes his metals for his customer's benefit, but guards his own profits in knowing that he is not throwing away metals.

In filling an order the foundryman is anxious to satisfy his customer's formula first, and to make a profit in so doing. The following typical ingots are obtainable:

	No. 1	No. 2	No. 3	No. 4
Copper	79.50	82.00	85.00	82.00
Tin	10.00	8.00	5.00	4.00
Lead	9.50	7.00	5.00	7.00
Zinc	0.50	2.40	4.50	6.00
Iron, Sulphur				
Antimony	0.50	0.60	0.50	1.00
Arsenic				
	100.00	100.00	100.00	100.00

That is, an ingot can be furnished having 79.5 copper, 10 tin, 9½ lead, with a balance of ingredients 1% or less: from this grade the ingots range to No. 4 a low tin, red brass, very suitable for commercial red brass work. No. 1 is the most expensive ingot, not only because of the high tin, but also because of the low zinc content. This ingot should be bought at ¾c to 1c under the price figured on the New York Metal Market. No. 4 should be bought at 1¼c to 2c under the metal market figure.

The variations in price are due as well to the allowable variation that the foundryman will grant. If, for instance, he will allow 1% zinc in No. 1, 79 to 81½% copper, 8 to 10% tin, and 9 to 10 lead, and pay only for the metals that the anlysis shows, he could obtain the material for 1 to 1¼c under the figured price. If he will allow 2% zinc, he should receive the benefit of 1½ to 2c reduction. A foundryman buying in large quantities can afford to allow a strong variation in contents, since he always knows this content exactly, and applies his various lots of ingots to various orders without danger of losing money or of disappointing a customer by using the wrong metal; but, the main thing, he also buys his ingots at the best price, since he can allow the ingot maker a reasonable variation in filling orders. This enables the ingot maker to fill orders with less expense and delay. For such allowable variation the foundryman will receive a reduction in price of ¼ to ½c, in addition to the reduction above. The limits instead of being 1% may be as high as 3%. Knowing the contents the foundryman grants these limits, receives a lower price and carries a greater variation in metals on hand. The purchase of ingots to analysis means a full return to the foundryman: he can demand a full guarantee that the metal is like the sample or test ingots.

The melting loss in using brass ingots will be less than that existing with the use of scrap. The exposed surface per unit content is less in the first place, and there will be less surface oxidation. In the second place the foundryman will not have to melt unnecessary dirt or dross or to melt material in which the zinc, for instance, is high and it will therefore be necessary for him to add unusual amounts of other metals to bring the pot to the right analysis. Since he knows exactly what each pot contains at the start, the

enriching or cutting down is absolutely under his control. Or if the ingot is approximately correct for the casting desired, a small amount of one or more new metals in addition is always sufficient for the purpose. This means quick heats, low melting ratios, freedom from gas, and a low loss in melting.

The use of brass ingots means a low handling cost; carrying from car to storeroom and the placing of a tabulator card on the pile covers the handling. There is no sorting to do; no rejection of junk, iron, zinc, babbitt, solder, and the various impurities sometimes found in a barrel of so-called clean brass or bronze. The saving here is obvious.

It is not intended here to present scrap ingots as a substitute for new metals. It is true, however, that brass ingots properly made can be used with economy and without detrimental effects in all commercial castings containing copper, tin, lead and zinc. They can be purchased and used to advantage in castings even where zinc is limited to ½%; and they can be used obviously in any casting where scrap is allowable. They are, of course, unsuitable for a pure mixture of copper and tin, since lead and zinc are always present, and should not be used where the buyer specifies all new metals and pays accordingly. The best foundries today are buying these ingots, mixing with scrap copper, and with new material as well, when necessary, and are turning out excellent castings. By buying on analysis in their laboratories and so obtaining uniformity, full value and known contents, such foundries have every advantage over the jobbing foundry buying scrap from various sources. The big foundry, even with its high fixed charges, by use of such ingots, can underbid even the one man plant, on the basis of delivering metals for value received; or in other words, insisting with the customer that he knows what he is buying and paying for. In many cases brass and bronze specifications are extremely lax. The foundryman in competition will find it to his advantage to establish a customer's analysis for him and to maintain the grade at all times. These ingots, properly made, will be of the greatest assistance in this kind of work.

The electrodeposition of bismuth is never used, as the deposit has not been found of any value.

Brass and Bronze Plating Solutions and How to Make Them.

First Paper.

Introductory.

The electrodeposition of brass and bronze is now carried on more extensively than ever before and the demand is constantly increasing. Its object is to give iron or steel articles the appearance of brass at a less cost than solid metal. While the majority of brass plated goods found on the market are hardly a credit to the art of electrodeposition, there are some that are fine examples of brass plating and it is these that indicate what can be done in the way of electrodepositing this alloy.

Brass is composed of copper and zinc. Bronze is also composed of the same metals as far as its electrodeposition goes. While bronze is supposed to contain tin, when bronze castings are considered, tin is rarely used in a bronze plating solution for the reason that it is then more difficult to work, and the bronze color can be obtained with copper and zinc alone, and at a much less cost and with less trouble. The reason that brass can be deposited so successfully is that it changes color when the proportion of copper and zinc changes. If there is too little zinc deposited, the color becomes redder. If the zinc is plating in excess, the deposit is too pale. The brass deposit itself, therefore, is the "barometer" of the condition of the solution. Were copper and zinc of the same color, it would be impossible to deposit at the same time in a commercial manner for the reason that there would be no method of ascertaining whether more of one metal was deposited than the other.

The electrodeposition of brass is unquestionably the most difficult of any plating operation. It is comparatively easy to deposit brass, but the real difficulty appears when one is obliged to deposit the same shade of color day after day. It is then that the skill of the plater is taxed to its utmost.

Brass and Bronze Colors.

From the standpoint of electrodeposition, brass and bronze differ only in the amount of zinc. They are both alloys of copper and zinc

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These papers will be continued for a number of months.

When a small quantity of zinc is alloyed with copper, bronze results. A larger amount of zinc produces yellow brass. In the plating trade, bronze always means the following proportion of copper and zinc:

Composition of Bronze

Copper	90%
Zinc	10%

As previously mentioned tin is very rarely used. It is not only unnecessary but is more expensive. If, in the bronze mixture, the zinc is less than 10%, then the color becomes redder. If more than 10%, the shade becomes orange and, as more zinc is used, becomes yellow.

In the electrodeposition of brass, two shades of brass are known:

1. Green Brass.
2. Pure Yellow Brass.

Green brass is the most beautiful of the brasses and it is the desire of those who deposit brass upon goods for the art metal trade. For ordinary brass plating, the pure yellow shade is used. It must frankly be said, however, that the majority of brass platers are quite satisfied if they are able to obtain any shade of brass as long as it is brass. They usually find so many difficulties in the way that the color is not a matter of consequence as long as it is yellow. There is no difficulty, however, in obtaining and maintaining the exact shade if the solution is constantly looked after and kept in normal condition.

The shade of the brass deposit may be altered as desired by increasing or decreasing the amount of zinc. It may be deposited all the way from a red copper up to a white zinc, and with the intermediate shades of bronze and brass. For reference, the following table of the colors of the brass and bronze mixtures are given. They will be found useful in brass plating for determining just what is necessary to add when the color of the deposit is "off":

Copper	*Zinc*	*Color*
100%	none	Red
95%	5%	Red Bronze
90%	10%	Real Bronze
85%	15%	Light Bronze
80%	20%	Green Brass
75%	25%	Green Brass
70%	30%	Yellow Brass
65%	35%	Yellow Brass
60%	40%	Orange Yellow
55%	45%	Orange
50%	50%	Orange
45%	55%	14k Gold Color
40%	60%	Yellow White
35%	65%	Gray White
30%	70%	Gray
25%	75%	Gray
20%	80%	Gray
15%	85%	Gray
10%	90%	Zinc Color
5%	95%	Zinc Color
None	100%	Zinc Color

From a perusal of this table, it may readily be found what is necessary in a brass or bronze solution when any particular shade is desired. For example, if the solution deposits a green brass and a true bronze is desired, then more copper carbonate must be added. It must not be inferred, however, that when a brass solution deposits a brass that is "off-color", that the above table will always serve to overcome the difficulty, as the current density, the amount of free cyanide and the concentration and temperature of the solution all have bearing; but when these conditions are normal and have not been changed, the table will help as it will show at once whether the solution needs copper or zinc.

(To Be Continued)*

A New Method of Making Compound Copper and Steel Wire.

An improvement in the manufacture of compound copper and steel wire has been made by Jean Baptiste Clamens of Paris, France (U. S. Patent, 1,011,744). The process is applied to the production of a compound wire with a steel core and a copper outside covering. Such wire, it should be known, is now in much demand for the reason that the advantage of the non-corrosive property and electrical conductivity of the copper is obtained, together with the strength of the steel; and in addition, the wire is much cheaper than the same size of copper. The production of the wire is carried on in the following steps:

1. Plates or disks 1 of steel are prepared, of any suitable diameter and thickness, preferably from 30 to 60 centimeters in diameter

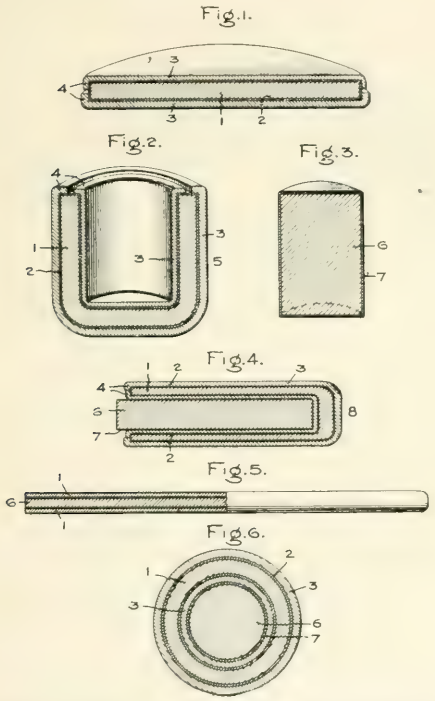
*The manufacture of the carbonates of copper and zinc will be described in the next paper.

and from 15 to 50 millimeters thick. They are cleaned and milled, so that their surfaces are without any defect.

2. In order to prevent oxidation in subsequent operations the disks are electroplated with copper, tin or zinc. This coating is indicated in the drawing by the numeral 2.

3. Copper obtained by electrolysis is cast into ingots and then is rolled into sheets of from one half to two millimeters in thickness.

4. From these copper sheets are punched disks 3 having a diameter 8 millimeters larger than the steel disks.



Clamen's Method of Making Compound Copper and Steel Wire or Rods.

5. These copper disks are stuck up to form a flange 4 4 millimeters wide around their peripheries, so that when a steel disk is laid upon one of these copper disks it will be retained centrally in place.

6. To each face of each steel disk is applied a copper disk, the thickness of one of said copper disks being from 4 to 10 per cent. that of the steel, while that of the other copper disk is but one or two per cent. thereof. The thicker copper disk is to form the outside of the wire, while the thinner one is to be welded to the mandrel hereinafter described.

7. This operation being completed, the compound disks are superposed one upon another to any number desired, alternating with plain steel disks to prevent their welding together. Heavy top and bottom plates are applied to the pile and the entire mass is heated to a temperature of 800 to 900 degrees centigrade and placed in a hydraulic press to effect an association of the copper with the steel.

8. After thoroughly cooling, the compound disks are cleaned, and are then struck up by a press to form cupped sleeves or sockets 5 having a diameter of 100 to 150 millimeters, a height of 200 to 250 millimeters and an internal bore or cavity of 80 to 90 millimeters. The thicker copper layer is on the outside and the thinner layer on the inside of these sockets.

9. Extra mild steel core bars 6 of the same diameter as the interior of the sockets and somewhat longer are thoroughly cleansed and electroplated with a light coating 7 of copper.

10. The copper-coated mandrel or core is introduced into the bimetallic sleeve or socket and the ingot 8 so obtained is reheated at a high temperature.

11. At the proper temperature, the ingot, which has a weight of about 40 kilograms, is rolled in mills having rolls provided with round grooves, so that the ingot will be reduced in diameter to about 45 millimeters. The closed bottom of the socket is presented first to the rolls so that the metal of the socket will be stretched and will cover the longer mandrel or core in the welding process effected by the rolls.

12. The ingot is then reheated and is further rolled in a three roll mill and an ordinary wire rolling train adapted to produce wire of 4, 5 and 6 millimeters in diameter. These wires may be still further drawn down to any desired diameter. They are quite inoxidizable, and may be coated with gold or silver, and are capable of use in any industry.

It will be seen from Fig. 5 that the wire is composed of a steel core provided with a thin copper sheet, outside of which is a thick steel jacket having an external heavy coating of copper.

Manganese has more affinity for sulphur than any other metal, and when alloyed with other metals has the property of uniting with the sulphur and then rising to the top of the molten metal as a slag of manganese sulphide. On this account it is an excellent addition to many bronzes.

A New Self-Contained and Combination Sand-Blast.

In many instances, it is inconvenient to be obliged to fit up a sand-blast with a lot of piping and in order to obviate this annoyance, a new combination sand-blasting outfit has recently been placed on the market. This outfit is herewith illustrated in Fig. 1 and is very compact and complete, including the sand-

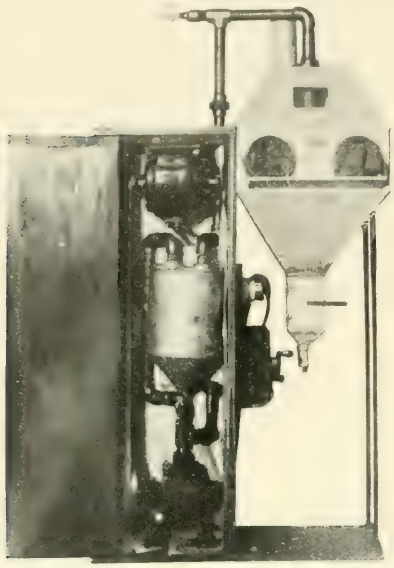


Fig. 1. The New "Leiman" Self-Contained Sand-Blast Machine.

blast proper, blower and pipe connections. As will be seen, the blower and motor are located in the box at the side of the sand-blast to which the latter is fastened. This box has a door which may be closed while the machine is in operation, thereby protecting it from dust and dirt. The sand-blast hood is equipped with an electric bulb, so that the actual turning on of the current for starting the machine, not only starts the blower and sand-blast, but also lights up the interior of the machine so that the work may easily be seen, no matter how dark the room may be in which the machine is situated.

This novel sand-blast is manufactured by Leiman Bros., 62 John St., New York City, who have been manufacturing sand-blasts and blowers for the past twenty years. This machine is equipped with their ingenious automatic, continuous feed sand-pipe by means of which the same sand is used over and over again, so that a half pail of sand will be sufficient for operating from several days to a week, according to the kind of work done.

This sand-blasting outfit should find a large field among platers, manufacturing jewelers, and metal manufacturers, and as they are made in four or five sizes, they are well adapted to all kinds of establishments. The sand-blast is the ideal method of producing a surface for electroplating and is now extensively used for such a purpose. It is also valuable for removing sand from brass castings and for producing a matt or dead surface on metals in place of the uncertain matt dip, and for this purpose has the distinct ad-

Fig. 2. The New "Leiman" Pressure Blower. The Smallest Size Ever Made.

vantage that it can be used on large or small work, while the matt or dead dip is limited to comparatively small work.

Leiman Bros., have also recently placed a small pressure blower upon the market which, it is believed, is the smallest ever made. This blower is used for work requiring a very small volume of air. It is shown in Fig. 2.

The Electrodeposition of an Alloy of Silver and Cadmium.

As considerable interest seems to be displayed at the present time in regard to the electrodeposition of an alloy of silver and cadmium, a few remarks upon the subject may be opportune. While this subject at first seems attractive, a realization of the conditions which must be met and the difficulties which are confronted in depositing the two metals simultaneously, will surely result in a different view of this apparently attractive process.

The electrodeposition of an alloy of silver and cadmium was first brought out in 1892 by S. O. Cowper-Coles of London, the well known English inventor. He was granted a patent (British Patent 1,391 of 1892) upon the process and a company was formed to use it. Flat-ware was plated by it and it was believed

that the process was going to revolutionize the art of silver-plating. Silver is far more expensive than cadmium, and it was believed that the cheapness which the cadmium imparted would result in the extensive employment of the process in the manufacture of plated flat-ware and hollow-ware.

Cadmium is almost as white as silver, and alloys well with it so that an alloy of the two metals has a white color. If the alloy does not contain much more than 20 per cent. of cadmium, it rolls well into sheet and may be used as an anode. The solution used was made up by the inventor of the process as follows.

Take 1 oz. of metallic silver and 23 oz. of cadmium. Dissolve in nitric acid and make up to about a quart by the addition of water. Then add carbonate of soda (to neutralize the free acid) until the precipitate just begins to form and finally add a solution of potassium cyanide in water (strong solution made by dissolving 2 lbs. in a gallon of water) until the silver and cadmium have both been thrown down as cyanides. Care must be taken to just precipitate them as an excess will dissolve the precipitate again. Filter off the precipitated cyanides of silver and cadmium (both are white) and wash with water well. Then dissolve in more of the cyanide solution used for precipitation until the precipitate just barely goes into solution. Make up the whole volume to 2 gallons and add 8 oz. of potassium cyanide for free cyanide. The solution is then ready for use and is best when worked warm at a temperature of about 120° F. The solution, therefore, contains about the following:

Water	1 gallon
Cadmium	11½ oz.
Silver	½ oz.
Free Cyanide	4 oz.

The silver and cyanide, as previously directed, being converted into cyanides and dissolved in potassium cyanide.

The plating is carried on in the usual manner followed in silver plating and may be done cold, but the best results are obtained when warm. For an anode, an alloy of

Silver	85%
Cadmium	15%

is used. This alloy rolls well into sheet and a rolled anode, therefore, is preferable.

The process, as previously stated, was at one time carried on in England, but as far as known was never a commercial success. It was known as "Arcas" plating, and the deposit was claimed equal in non-corrosive properties and color to the best quality silver plate. It is not carried on at the present time.

The Difficulty with the Process.

The difficulty with the process is that it is almost impossible, from a commercial standpoint, to maintain the proportions of the cadmium and silver in the deposit. They are both white and there is no way of ascertaining, except by chemical analysis, whether more or less cadmium or silver is depositing. Variations in current density, in temperature, in strength of solution, in amount of free cyanide, in anode surface and proportion of cadmium and silver present, will all alter the relative amounts of cadmium and silver deposited. For this reason, the deposit will vary (and experience has demonstrated that it does) to a great extent. It has been found by some who have tried it that the deposit is very variable and uncertain, and there is no method known of ascertaining whether the right proportion of cadmium and silver is depositing except by analysis which, of course, would hardly do as a commercial proposition while the plating is going on. Were the two metals of different colors, like copper and zinc which are deposited in the form of brass, then the matter would be different. With a brass deposit, the color always indicates whether the deposition is going on properly. If it changes in color, then it is an immediate indication that the solution needs attention. The color of the deposit, then, is the "barometer" of the process.

In the case of the deposition of silver and cadmium, however, both metals are white and there is nothing to indicate to the eye whether the operation is going on properly, nor is there any way of ascertaining. It is believed, therefore, that the deposition of silver and cadmium cannot be carried on successfully from a commercial standpoint, although it is possible theoretically.

Metallic cadmium resembles zinc in its properties but is not quite as easily tarnished upon exposure to the air. In time, however, cadmium tarnishes and for this reason, its electrodeposition has not been found of much value.

A New and Novel Apparatus for Burnishing by Means of Steel Balls.

A new and novel apparatus for the burnishing of metals by means of steel balls has recently been patented. This appliance, or tool it really may be called, is intended to supplant the well known and time-honored hand burnishing tool. While this new appliance is to replace the hand burnishing tool, it is, in reality a power burnishing tool as it is employed while rapidly revolving by any suitable means.

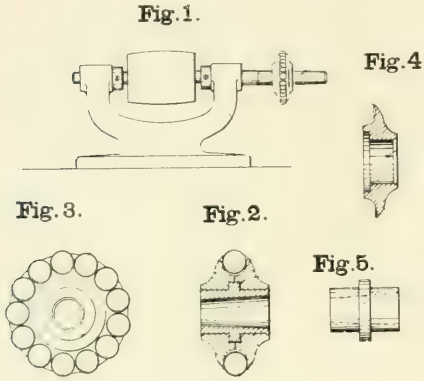


Plate 1. Showing the Balls and Manner of Holding. Also How Used in Polishing Head.

Hand burnishing is done by either an extremely hard steel tool with a smooth surface, or one of bloodstone with a similar surface. The burnisher, held in the hand, is passed over the surface of the work to be burnished. In order to make it pass over the surface easily, soap water is used for a lubricant, and considerable pressure is brought to bear upon the burnisher. Naturally the burnishing operation is slow and skilled labor is required.

In the present invention, steel balls (which are as hard as any burnisher and with equally as good surface) are fitted in a groove in a head which can be revolved by power. The balls are loosely mounted so that they can revolve themselves while the burnishing is carried on. To burnish work, the head, containing the balls, is revolved and then the balls pressed against the surface to be burnished and lubricated in the usual manner. The use of the balls is intended to render the burnishing operation more rapid and obviate the necessity for employing skilled labor.

The process and apparatus are illustrated in Figs. 1-14 and the different forms of grooves used are shown. In Fig. 1 is shown the tool fitted to a polishing lathe, but the burnisher may be revolved by any suitable means.

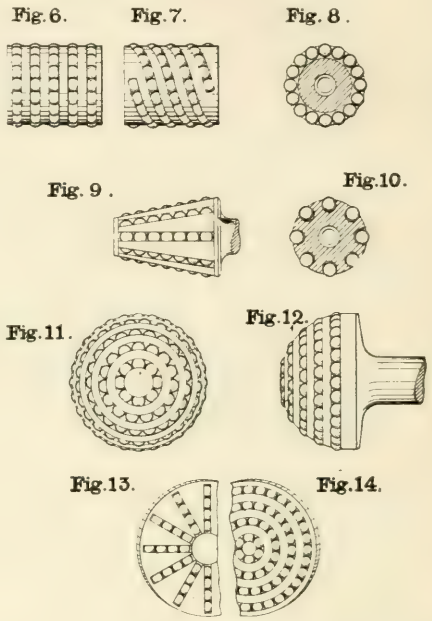


Plate 2. Other Forms of Heads Containing the Steel Balls.

The apparatus has been patented by Benjamin F. Dingley of Silver Spring, R. I., and the patent is owned by Ernest C. Baker of the Baker & Windsor Co., Providence, R. I. It is intended for use in burnishing gold jewelry, silverware and similar articles that are usually burnished instead of buffed.

The "Traud" Pan Grinding Machine.

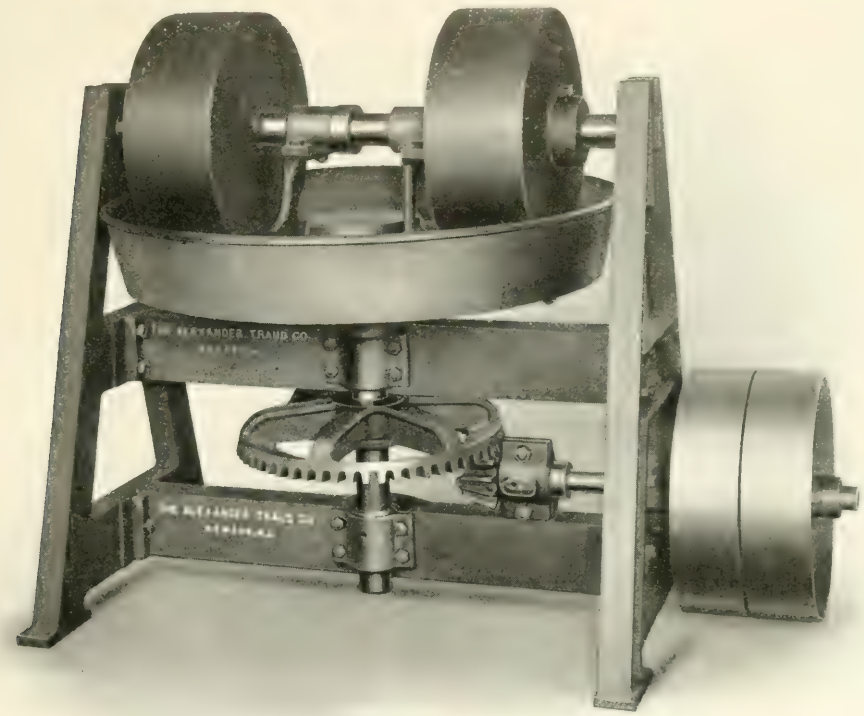
A very efficient form of pan grinding machine is being placed on the market by The Alexander Traud Company, 5 Maine Street, Newark, N. J. The machine is herewith illustrated and was designed by them for grinding silver sweeps, refining wastes, and similar precious metal materials. It is also useful for grinding all kinds of mineral matter, pigments, etc.

The machine frame is made of the channel type which gives maximum strength. The pan design is an interesting point. The sides are high so as to prevent material from being thrown over them while the pan re-

volves. The machine, therefore, can be run faster than with lower sides to the pan. Situated in the bottom of the pan is a false bottom covering the entire surface. This allows easy and rapid replacement when it wears through. The pan bottom, it will be appreciated, is subject to the greatest wear, and by making it renewable, therefore, repairs can be made at the minimum cost. It is held by four bolts countersunk at the heads.

machine as it is well known that dust is the greatest enemy of grinding machinery.

The efficiency of the bearings may be appreciated when it is known that the foot bearing underneath the pan really carries the weight of the rolls, the pan and the material being ground. It is of a special design known as a "ball joint" and enables any uneven load to be taken care of without injury to the machine.



The "Traud" Pan Grinding Machine for Grinding Silver Sweeps, Minerals, Etc.

The rolls are extra large and the surface is chilled so as to give the longest wear. They may readily be removed from the machine as there are no bolts or screws holding them in place. The renewal of the rolls, therefore, may be accomplished with the minimum amount of labor.

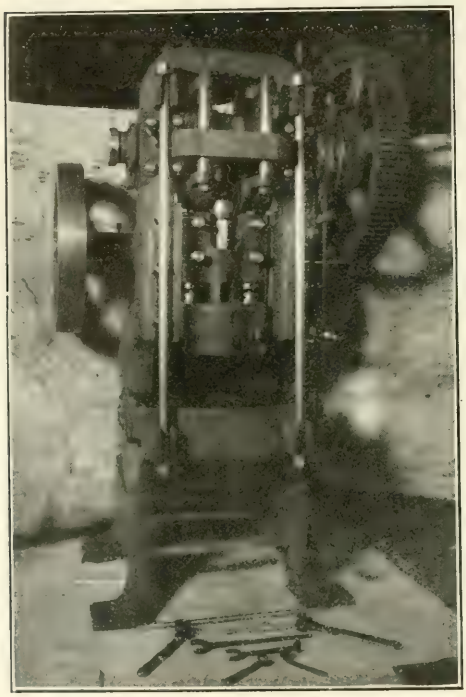
Lubrication is carried out by grease and grease cups are all centralized on the journals and bearings and are placed in such a manner that dust from the machine cannot enter the bearings and injure them. Particular pains have been taken to perfect this part of the

A New Double-Acting Cam-Press.

The Standard Machinery Co., 7 Beverly St., Providence, R. I., have just placed on the market a new double-acting cam press. The following is a description of the press:

The machine is similar in design to their line of "B" power presses which have been made by them both plain and geared, as well as single acting and double acting for several years'. This particular design was brought out for the deep drawing at a single stroke of

light and medium guage metals, and to produce the maximum draw at one stroke that stock of this nature would stand. It is a machine that is especially designed for the drawing and forming of stock with maximum flow and maximum ductility without broaching or breaking, such as mild aluminum, brass and copper. The machine is equipped with an extra heavy drop forged crankshaft with tool steel cams forced over the wings of the shaft which are on either side of the upper connection of the inner or drawing ram. The diameter of the wrist pin on the inner or drawing ram is 3½". Some idea of the strength of the shaft and some idea of the power of the press is shown when the bore of these cams is 7⅛" which is the same diameter as the wings of the crankshaft. The length of the cams overall is 4⅜" and they have actual bearing surface of 3". The press is equipped with boxes 9" in length; maximum radius of the cam is 7/16" and the minimum 4 1/16" allowing a throw on the blanking ram of 3". This is an unusually large throw for blanking ram of a cam press and the object of it is to allow the production at a single stroke of a piece over 3" high without a raising die. The drawing stroke or the stroke of the inner plunger is 7" and the machine is so arranged that the blanking and drawing ram leave on the up stroke at the same time. This is controlled by the setting of the cams on the crankshaft.



New Form of Double Acting Cam Press Made by the Standard Machinery Co., Providence, R. I.

The Methods in Use For Testing the Hardness of Metals.

The testing of metals for hardness is now frequently done and is attended with good results, when comparisons are to be made. Its use in steel metallurgy has been attended with particularly good results. There are several methods in use for testing hardness and the following is a short description of each as now employed:

The Brinell method is more extensively used than any other for the non-ferrous alloys and is based upon the resistance offered to indentation by a hardened steel ball. The metal to be tested is placed under the ball and pressure applied. The amount of indentation is determined by a micrometer miscroscope, reading to 0.00004 of an inch. The measurement is taken upon a line drawn upon the piston used for forcing the ball into the metal.

The cone test is similar to the Brinell method except that a hardened steel cone is used instead of a ball. The cone is 90° angle and is open to the objection that the point soon becomes dull or broken, and in the case of hard steels, it flattens. The ridge formed at the mouth of the indentation also interferes with the measurement.

The Shore method used the so-called "scleroscope". In this process, a hardened steel hammer is allowed to fall upon the metal to be tested. The height at which it rebounds is measured. This hammer is guided in falling by a glass tube. The rebound is measured directly by a scale on the back of the tube.

The Bauer method uses a steel drill for drilling into the metal to be tested. This drill is run at a constant speed and feed and really indicates the cutting hardness. It cannot be called a real hardness test, but may be used to indicate the relative working qualities of metals. It is used on cast-iron more particularly.

The Ballantine testing process has for its principle the amount which a lead disc is indented when a falling hammer is allowed to

impinge upon the metal to be tested. A hammer is released by a trigger, and the force drives a steel point into the test piece. The lead disc between the hammer and piece then becomes indented a certain amount depending upon the hardness of the metal. This method is not used to any extent.

The Brinell and scleroscope methods are the ones extensively employed in testing the hardness of metals, and the Brinell apparatus seems to be in particular favor for non-ferrous metals.

New Type of Electroplating Dynamo.

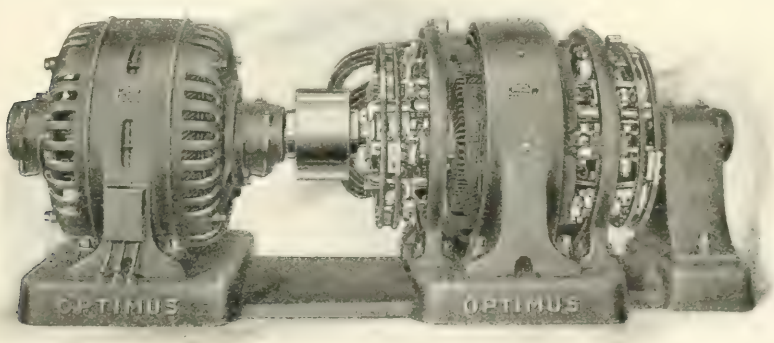
A new form of low voltage dynamo for electroplating and other electrolytic work has recently been placed on the market by the Munning-Loeb Company of Matawan, N. J. The machine is known as the "Optimus-Dynamo" and many new and useful features are embodied in it. The dynamos are designed along modern lines as a glance at the illustration will indicate.

compound winding, and is not secured by any manual shifting of field rheostats. This uniform voltage characteristic makes it possible for the plater to throw different tanks in and out of the circuit at will, without having to worry about its affecting the voltage of the dynamo. There is thus never any danger of burning the edges of the work due to short periods of high voltage, nor is the work unnecessarily retarded by slow deposition of metal due to low voltage.

The compound winding also maintains a fixed neutral position for the brushes on the commutator so that sparkless commutation is secured without shifting of the brushes with changes in load.

The brushes are made of a special carbon composition and are held against the commutator by means of an adjustable clock spring. A flexible braided copper cable carries the current away from the brushes and thus provides a constant contact instead of the sliding contact so often depended upon.

The "Optimus Plating Dynamo" is wound for either two or three wire circuits. They



The "Optimus" Plating Dynamo Recently Placed on the Market by the Munning-Loeb Co., Matawan, N. J.

Except in smaller sizes, the dynamos are of the multipolar type as it has been found that a much better magnetic distribution and higher efficiency can be obtained than with the bipolar type.

The "Optimus Dynamo" is a compound wound and reference to a test curve proves that these dynamos give a practically constant voltage from no load to 25% overload. This remarkably constant line voltage is automatically maintained by means of a special

are also furnished in all sizes from 300 to 50,000 watts.

After a long discussion, the Torquay (England) Town council decided to use copper instead of zinc for the roof of their town building as inquiries showed that the life of a zinc roof is but twenty years, while a copper one lasts indefinitely as well as having a more pleasing appearance.

Questions and Answers.

QUESTION No. 1085. We want a mixture that will resemble Monel-metal in color but which will cast better. We desire to use for ornamental castings of a white color. We have not been able to cast Monel-metal successfully as it melts at too high a heat and the castings are porous. We understand that there are mixtures of the same color that can be used. The color of the Monel-metal is all right and we wish something like it.

Answer. The following mixture will give you a metal whiter than Monel-metal and which is very suitable for ornamental castings as it does not corrode. It casts particularly well.

Copper	50 lbs.
Zinc	35 lbs.
Nickel	15 lbs.
Aluminum	2 oz.

Do not pour the metal too hot as it melts very easily. It should not smoke but very slightly when being poured.

QUESTION No. 1086. What will take out the yellow stain on glass caused in firing silver deposit ware?

Answer. As this is caused by fluxing during the firing, of some substance on the glass, and is actually burned in, you will not be able to remove the stain.

QUESTION No. 1087. Can Monel-metal be brazed like copper? If so, what is used for brazing?

Answer. Monel-metal can be brazed much better than copper for the reason that it does not melt as easily. Use spelter solder or silver solder, in the same manner and of the same kind as for brazing copper. Silver-silver gives the best results as it is white and matches the color of the Monel-metal.

QUESTION No. 1088. A brass solution which has worked satisfactorily for some time suddenly begun to give trouble. An analysis of the contents showed:

Copper	2.4%
Zinc	0.8%
Free Cyanide	3.2%

The deposit is of good color but extremely slow in forming. The anodes cover with a blackish deposit and have to be cleaned twice a day. The solution stands 18° Beaume' and is used cold. Can you suggest any cause?

Answer. From the fact that your deposit is slow in forming is indicated that there is not enough metal in your solution. We suggest adding more copper and zinc carbonates. Then add a little more free cyanide. The fact that your anodes coat over does not mean anything. All brass anodes have to be cleaned frequently. However, a little more free cyanide can be used to a good advantage and you will not have to clean your anodes as frequently. There is a possibility, too, of your solution, by reason of the potassium cyanide having become old and partially oxidized and we suggest throwing away some of the solution and replenishing with new. This is customary in the best regulated shops and serves to maintain a more constant solution.

QUESTION No. 1090. I am plating bag frames of cold-rolled, dead soft steel. The goods are first plated in brass, then in nickel and then in silver. Afterwards they are oxidized with liver of sulphur. They are finally lacquered with a good cotton lacquer. I am finding that after a day or so, the frames turn rusty and small, dark spots appear on the surface. These spots are of such a character that the frames are unfit for the market. What can cause these spots on the surface?

Answer. An examination of the frame sent indicates that the spots are caused by blisters on the surface. They were produced during the plating of the steel with brass. It is a very common occurance in brass plating steel. Each minute blister holds plating solution underneath and finally, after the goods have been finished, it oozes or exudes from the blister and stains the surface. The cause of the blisters is imperfect cleaning of the steel from grease or oil, too strong a current in brass plating or too much free cyanide in the solution. All these causes, too, may work together. The use of too strong a current in the brass plating is the most frequent cause. This is easily ascertained by watching the work while being plated. If the gas bubbles come off very freely, then the current is too strong. It should come off very slowly.

QUESTION No. 1091. What can be used for stripping silver from silver deposit ware?

Answer. We suggest the use of 1 part of nitric acid and 1 part of water, used slightly warm (not hot) as this will dissolve the silver without attacking the glass. If hot, it is apt to attack some kinds of commercial glass (so-called "leaded" glass or that containing oxide of lead as one of the constituents) and slightly roughen the surface.

QUESTION No. 1092. What solution can be used to give brass a dead finish before painting? We are obliged to paint certain brass parts of automobiles, and in order to have the paint adhere, we are accustomed to roughen the surface with sand paper. Is there a solution into which we can dip the parts that will give the dead surface used for painting?

Answer. You will not find any solution satisfactory for your work and recommend the use of a sand-blast for producing the rough surface on your brass previous to painting. This method is extensively used for preparing metal surfaces for painting and is the cheapest and most efficacious.

QUESTION No. 1093. Is there any method or machine that will remove tin from its alloys, such as babbitt, the zinc-tin alloys etc? We have a quantity of such alloys in our establishment as refuse from die-casting and on account of the high price of tin, wish to reclaim it if possible.

Answer. There is no satisfactory method for removing the tin from such alloys as you have. About the only process that could be used would be to dissolve out the other metals with nitric acid, leaving (after drying and heating) a residue of oxide of tin. This could be directly smelted to tin. This process, however, would be too costly and you would not be able to use it. You will have to sell your scrap metals for what they will bring.

QUESTION No. 1094. I am having trouble with my liver of sulphur solution. Copper is deposited on iron and then oxidized with the liver. When this has been done, the copper is eaten right away leaving the bare iron. I am using the liver of sulphur cold, probably 45 or 50 degrees F. What is the remedy?

Answer. The trouble may be caused by three things:

1. Your copper deposit is too light.
2. Your liver of sulphur is too strong.
3. You are leaving your work in the liver of sulphur solution too long.

Which of these is the difficulty, we cannot ascertain without actually seeing the work. Use from 1 to 2 oz. of liver of sulphur to the gallon. You will find by a little experience and a few trials what the matter is with your operations and you can then remedy them. The usual difficulty, however, is that platers do not deposit enough copper on their work.

QUESTION No. 1095. I have a number of nickel castings to make which will weigh about 300 lbs. each. Will you advise me the most practical way of making the mold for such a size casting? Should it be cast in dry sand or green? Would you advocate the use of black-lead on the mold? What flux would you recommend? These castings must be as pure as possible.

Answer. You will have to use a dry-sand mold as green sand will chill the metal so that it will not run. You will find French molding sand very advantageous for this purpose as it can be dried clear through and still have considerable tenacity. Nickel anode makers use it. You can black-lead the face of the mold as this will serve to produce a smoother surface on the casting. As a flux, makers of nickel anodes in this section, use about 2 parts of lime and 1 part of fluor-spar, well mixed. If you find it is too thick when melted, add more fluor-spar. If too thin, add more lime. You will find some difficulty in making soud castings of pure nickel. They are apt to come porous. Nickel anode makers do not use pure nickel but alloy it with iron and tin. They use from 5 to 8 per cent of iron in the form of tool steel scrap (old files are frequently employed) and about 3 per cent of tin. These additions bring down the percentage of nickel to from 90-92 per cent so that the metal melts easier and casts sounder.

QUESTION No. 1096. We are manufacturing a line of brass plated steel curtain rods. Our present method of plating is as follows: 1 Sheet steel is rolled in rolling machine to tube form; 2. Rattled in sawdust to remove grease; 3. Hot lye bath; 4. Rinse in hot water; 5. Muriatic acid dip; 6. Cold water rinse; 7. A 25 minute plate in a brass solution; 8. Rinsed in hot water; 9. Rattled in saw-dust to dry; 10. Rattled in fine leather dust to impart a polish on same.

These rods are cheap goods, selling from $1.75 to $8.00 per gross and we cannot afford to polish on a buff wheel. We must admit that some manufacturers produce a better finish than ours. Our chief trouble, however, is the fact that the brass plated rods take on a brown hue when exposed to the air. Is it customary to lacquer such cheap, brass plated goods? We have never lacquered these rods and would like your opinion on same?

Answer. No kind of brass, either solid metal or plated, will remain in the air without tarnishing, and you will have to lacquer the rods if you wish them to retain their color. It is customary to lacquer even the cheapest kinds of brass and brass plated goods. You can, of course, use a very cheap lacquer for this purpose. As far as the finish on your rods is concerned, this is a question of rolling. If you wish to obtain a fine finish after brass plating, you will have to roll until the rods have a polish. Possibly you are not using a bright brass solution. We suggest it as it will greatly improve the brass deposit.

QUESTION No. 1098. How can solder be removed from platinum? The platinum must not be attacked.

Answer. You do not say what kind of solder it is. If soft solder, then you can remove either by dilute nitric acid (1 part of acid and 1 part of water) or muriatic acid. The acid, in either case should be slightly warm in order to cause it to act more rapidly. If you have silver solder, then you will have to use the dilute nitric acid as previously mentioned.

QUESTION No. 1097. I want to make an ornamental casting of aluminum, but desire it a different color and still have it as light in weight as I can. What would you advise me to use?

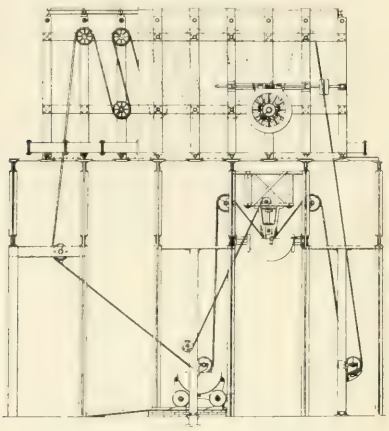
Answer. We advise you to make a wooden one and coat it with bronze paint! Your question is rather silly as every one knows that all the colored metals are heavy. What you are seeking is the "philosophers stone" which alchemist of old believed would change lead to gold!

QUESTION No. 1102. Can a German-silver be used for making white metal plumbers' goods, such as faucets, cocks, etc., by the addition of a small quantity of aluminum to make it run well? We find that the aluminum makes it whiter.

Answer. We fear you will not find it profitable. The aluminum makes the castings leak and you probably find that the number of leakages is so great that there is no profit in the manufacture. This is what manufacturers of plumbers' goods say and we believe they are right. Were it not for the leakage, aluminum would be used both for brass and German silver.

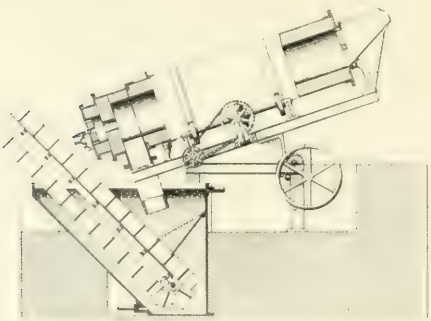
Patent Abstracts.

1,010,720, Dec. 5, 1911. AUTOMATIC JAPANNING APPARATUS. David Broderick of New Britain, Conn. Assignor to Sargent & Co., of New Haven, Conn. This invention is upon a conveyor and oven so that



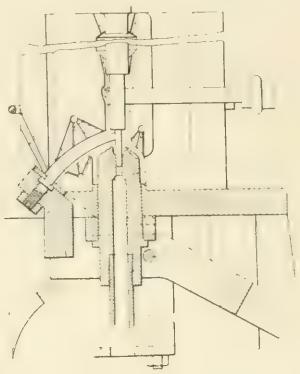
the work to be japanned is automatically dipped into the japan and carried up through the oven and back down again to the workroom where is is removed in a finished condition. The speed of the machine is regulated to conform to the time necessary in the oven.

1,010,392, Dec. 5, 1911. ROTARY FURNACE. Edward S. Davis of Jersey City, N. J. Assignor to the Rockwell Furnace of New York City. A rotary furnace using liquid or gaseous fuel and used for annealing or hardening small articles. This furnace is



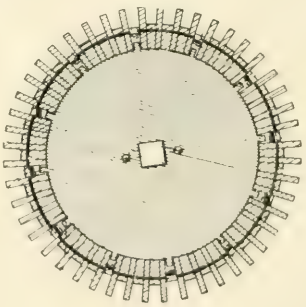
designed for use with rough blanks which would injure a helical lining. The lining, therefore, is made plain and special means are used for dumping the work after it has passed through.

1,010,313, Nov. 28, 1911. Nov. 28, 1911. CASTING MACHINE FOR SIPHON HEADS. Francis Albert Poncet of Paris, France. A machine for casting the siphon heads of the bottles used for holding artifically charged mineral waters. These heads are made of a britannia metal alloy, of which



tin is the base. The head is cast under pressure and the feature of the machine is in the manner of making the mold. It is made with "drawbacks" for forming the core and with means for producing the article in a finished condition.

1,001,323, Dec. 12, 1911. BUFFING WHEEL. William J. Courtney of Chicago, Ill. A buffing wheel intended more particularly for buffing and polishing flat ware and cutlery in

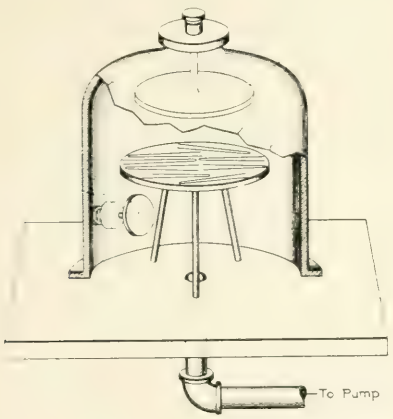


hotels. Pieces of leather, felt or other material are set in the periphery of the wheel as shown. They are made detachable so that they can readily be replaced.

1,011,203, Dec. 12, 1911. PROCESS FOR PICKLING ALUMINUM AND ITS ALLOYS PRIOR TO GALVANIZING OR COATING SAME WITH OTHER METALS. Stephen Jahn of Charlottenburg,

Germany. Assignor to Aktiengesellschaft Mix & Genest, telephon und Telegraphen Werke of Berlin, Germany. The use of a hydrochloric acid solution for pickling is claimed and with the addition of a small quantity of glycerine. The proportions recommended are: Water 1,000 parts; 500 parts of hydrochloric acid; and 150 parts of glycerine. It is claimed that aluminum so treated can be galvanized or coated with other metals.

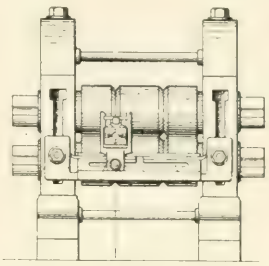
1,010,866, Dec. 5, 1911. PROCESS OF MAKING COMPOSITE CONDUCTORS. Wm. D. Coolidge of Schenectady, N. Y., Assignor to the General Electric Co. of the same place. A filament is first made of thoria and this is given a coating of copper in a vacuum furnace by passing a current through it from



copper terminals. The copper becomes spattered with copper, and is then rendered a conductor. The filament is then given a coating of tungsten. It is claimed that such a filament can be used in an electric lamp in a single loop on account of its increased resistance.

1,011,735, Dec. 12, 1911. APPARATUS FOR DISCHARGING SAND AND CASTINGS FROM FLASKS. John Wilson Brown Jr., of Philadelphia, Pa. Assignor to the Enterprise Mfg. Co., of Philadelphia, Pa. The object of the invention is to provide suitable mechanism for discharging the casting and sand from the flask, and for cleaning the flask. This is done by means of a rotary conveyor and compressed air which forces the sand out of the flask and away from the casting. Suitable mechanism allows the casting to be discharged so that the sand leaves it and is discharged into a bin.

1,010,584, Dec. 5, 1911. GUIDE BOX FOR ROLLING MILLS. E. H. Carroll of Worcester, Mass. Assignor to the Morgan Construction Co., of the same place. The object

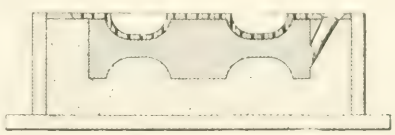


of the guide box is to provide for the strains and torque that follow in rolling rods. The The object is to render the box flexible and yet perform its function as a guide.

1,012,511, Dec. 19, 1911. METHOD OF DETINNING. Heinrich Brandenburg of Kempen-on-the-Rhine, Germany. The patent claim is upon the method of detinning tin plate scrap by immersing in either an alkali, such as potash or soda, or an acid, such as hydrochloric acid, and then exposing to the air. It is claimed, that by alternately exposing the scrap to the air after immersion, the tin becomes much more soluble.

1,012,385, Dec. 19, 1911. MACHINE FOR CLEANING WIRE GOODS. Guy Mafera of Revere, Mass. The process and machine are adapted for the making of bed springs and the object is to remove the grease from the wire while the spring is being made. This is done by passing it through suitable absorbent material while the wire is going to the former which absorbs the oil and grease on the surface. Sawdust is the material used as the absorbent.

1,010,392, Nov. 28, 1911. MOLD. Robert P. Lamont of Chicago, Ill. A form of riser or vent for use on sand molds. On perforated sieve-like shape of fire-brick, clay or other suitable material is placed on the mold in the



top of the cope, where a riser would usually be placed. It is claimed that a riser is unnecessary and the perforated shape prevents shrinkage and there is nothing to be cut off from the casting.

Trade Items.

A new brass and iron foundry is to be erected by Molin and Kershner of Reading, Pa. It will be situated on Robeson St., near Weiser St.

Ground has been broken for the erection of a new plant for the Lanston Monotype Co., at 24th. and Locust Sts., Philadelphia, Pa. The plant will be 77 x 276 feet six stories high, and will cost $200,000.

The Palmetto Metal Co., of Chicago, Ill., manufacturers of babbitt and bearing metals have reorganized and increased their facilities for making their goods. Their capital has been increased and manufacturing will be carried on in a more extensive scale

The jewelry coloring business conducted by Felix Vincon at 355 Mulberry St., Newark, N. J., has been bought by George McAleer who will carry on the business as before, but will add electroplating and polishing to the line. Mr. McAleer was formerly foreman of the polishing and coloring departments of Brassler & Co., Newark, N. J.

A new gold and silver refining business has been started by Henry Bender at 42 Walnut St., Newark, N. J. Mr. Bender was at the head of the melting and rolling departments of Croselmire & Ackor, platinum manufacturers of Newark, N. J., who recently sold out. Mr. Bender has fitted up a plant for handling all kinds of gold and silver materials and will make a specialty of rolling gold, silver and platinum for the trade.

The Bohlmould Co., has been incorporated in Brooklyn, N. J. Samuel Y. Barrows, Samuel J. Sampson, and Ernest L. Bohl. This company is to take over the patents and process of Ernest L. Bohl for the casting of metals in plaster of Paris molds. Mr. Bohl has been working his process for some time at 550 West 25th St., New York City and the method of making the molds and casting in them has been described in THE BRASS WORLD from time to time.

The Baird Machine Company, Oakville, Conn., have now moved to their new plant in Bridgeport, Conn., where they have one of the most modern and best equipped factories in the East. The factory is of brick and upon the line of the N. Y. N. H. & H. R. R. where the best of shipping facilities are had. The plant is located in the town of Stratford, just over the city of Bridgeport line, but all business will be transacted from Bridgeport as the plant, is for all practical purposes in this city. It is expected that some 200 hands will be employed when all arrangements have been made. This company manufactures a complete line of automatic wire and sheet metal working and forming machinery, tumbling barrels, presses, and the well known "Baird" tumbling barrel for use in burnishing metals by means of steel balls.

Thomas Weiss, who conducts a plating establishment at 47 Maiden Lane, New York City, has increased his establishment by taking additional space.

The National Cartridge Co., of Napa, Cal., manufacturers of ammunition, have been acquired by new interests and an addition to the works has been built so that the capacity of the plant is now increased.

David Maxwell & Sons, St. Marys, Ont. Canada, manufacturers of farm implements, have installed a nickel plating plant at their works in that place and will now do all of their own plating.

The Excelsior Needle Company of Torrington, Conn., manufacturers of needles and swaging machines, as well as bicycle spokes and other similar goods have commenced the manufacture of automobile carbureters. They are placing a carbureter on the market called the "Excelsior" and for which much is claimed in the way of efficiency and economy.

The Tube Bending and Polishing Machine Co., 1300 Bayard St., Baltimore, Md., which has recently equipped a new plant for the manufacture of tube bending and polishing machinery, are sending out to the trade a new circular describing their most recent pattern of automatic grinding and polishing machine for pipe, tubing and rod. This machine is manufactured after the Brinckman patents.

The Belknap Mfg. Co., 149 Water St., Bridgeport, Conn., are to build a new brass foundry in the near future. Their present one is too small for their business. They are one of the oldest manufacturers of steam and plumbers' brass goods in the United States. The new foundry will be located at their present plant and it is expected that operations will be commenced upon it within several months.

The Bristol Brass Company and the American Silver Company, both of Bristol, Conn., and, in the past, conducted as practically one plant and under the management of the same officers, have now been divided and will, hereafter, be conducted separately. A change has been contemplated for some time, and at a recent meeting of the directors, it was decided to divide the company into distinct corporations. Albert F. Rockwell, of the New Departure Company of that city was elected president of both companies. Pierce N. Welch was made vice-president of the Bristol Brass Company, and J. R. Holley, secretary and treasurer. Dean Welch was elected vice-president of the American Silver Company; Samuel B. Harper, secretary and assistant treasurer; and Alexander Harper, general-manager of the same company. The Bristol Brass Company is one of the oldest brass rolling mills in the United States. The American Silver Co., manufacture silver plated wares.

A brick addition is being built to the plant of the Art Stove Company of Detroit, Mich., stove manufacturers. The plant is located at Milwaukee Ave. and Russell St.

The Florida Metal Products Co., recently incorporated in Jacksonville, Fla., will manufacture ornamental metal work for the architectural trade. A new plant is being erected. Metal roofing and tiling will also be manufactured.

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, recently completed arrangements for installing a new brass foundry at their works in that place. They will not only supply their own needs but will be able to take care of some outside work. They manufacture hydraulic cider presses and wine making machinery.

The Birmingham Brass & Mfg. Co., has been organized at 14 Markham St., Toronto, Canada and has succeeded B. Johnson in that city. A number of Toronto men are interested in the new company. The manufacture of brass and iron goods will be carried on, and in addition electrical contracting and metal pattern making will be made specialties of the company.

The American Platinum Co., of Newark, N. J., manufacturers of platinum wares, have bought out the plant and business of Croselmire & Ackor of that city and will consolidate it with their own. Croselmire & Ackor have been in business for over 10 years, but the original members of the firm have not been connected with it for some time. C. Eisenach has been at the head of it since its incorporation.

The H. B. Ives Company, 11 Artizan St., New Haven, Conn., manufacturers of builders' hardware and hardware novelties, are completing their new plating room which will contain all the modern appliances known to the trade. This room will give them much larger space and their facilities will be much increased. This company manufactures cast German-silver pocket-knife tips for the trade and several years ago took over this business from the late A. M. Hill of New Haven, Conn. As far as known, these castings are the smallest castings made in the brass trade.

The Peerless Surface Machine Co., E. J. Bein, proprietor, Newark, N. J., announce to the trade that their machines are now giving the best of satisfaction in many plants for polishing all kinds of metals. Brass. bronze and steel castings, as well as cast-iron can all be polished or surfaced by these machines in a rapid and far more satisfactory manner than by the ordinary belt machine. The work may be rapidly done by unskilled labor and the surface produced will be found astonishing. This company also make endless belts for all classes of polishing machines. They would be pleased to send a new circular to any who may desire it, and which will give complete information about the kind of work the machines will do.

The Lorain Novelty Co. has been organized in Cleveland, Ohio and has commenced the manufacture of metal novelties and dies. The plant is on Lorain Ave.

The Fossee Novelty Company has been incorporated in Louisville, Ky., with a capital stock of $25,000 to manufacture electrical and mechanical novelties.

The Metallic Art Company, 125 Railroad St., Newark, N. J., manufacturers of silver and German-silver toilet articles, are retiring from business and the plant will be closed. W. E. Turton has been at the head of the enterprise.

The Standard Metal Work Co., of Thompsonville, Conn. , manufacturers of sheet metal goods, are now working upon an order for 10,000 powder cans for the Argentine Republic. Some of the cans are 4 feet long and 14 inches in diameter. They are to be used for storing powder on war ships.

The Clark Novelty Company of Rochester, N. Y., manufacturers of brass castings and metal hardware novelties, have acquired the plant of the American Drafting Furniture Co., in that city and will make some improvements to it for their own use. This plant is located at R. R. Ave. and East Main St., and the Clark Novelty Company will build a new brass foundry upon the property.

The International Chemical Co., of Camden, N. J., manufacturers of cleaning compounds for electroplaters etc., have just issued a circular on "Superior Lubricants for All Cutting and Drawing Tools Used by the Metal Trades." They have recently commenced the manufacture of this class of compounds and which have proved of value to the metal user. The circular will be mailed to those who desire it.

The Breeze Carbureter Company, 250 South St., Newark, N. J., manufacturers of automobile carbureters and other specialties, are starting a brass foundry at their works. Small furnaces will be used for the present and the output will be from 2,000 to 3,000 lbs. of castings per week. Aluminum castings, as well as brass and composition, will be made. This company is one of the oldest manufacturers of carbureters in the United States, but has heretofore had their castings made by outside parties.

The largest contract of its kind ever placed on the Pacific Coast has just been awarded to the Los Angeles Brass Mfg. Co., 711 North Main St., Los Angeles, Cal. It is for 171 ornamental bronze lighting posts which are to be used to beautify South Orange Grove Ave., in Pasadena, Cal. Some 60 tons of metal will be used in the manufacture of these posts and no scrap will be used at all. The Los Angeles Brass Mfg. Co., obtained the contract for the work after much spirited and close competition from Eastern concerns who maintained that no concern on the Coast could handle the work. They will, however, be able to turn out the order within the specified time.

The Precision Instrument Co., of Detroit, Mich., manufacturers of precision and recording instruments, have increased their capital from $24,000 to $48,000.

B. Conlan & Co., 87 Hamilton St., Newark, N. J., manufacturers of metal novelties, have completed their addition to their factory which now gives them the additional space necessary for their work.

The Wire Goods Company of Worcester, Mass., manufacturers of wire goods of all kinds, have purchased a tract of land seven acres in extent at Barbers Crossing, Worcester, Mass., and will erect a new and large plant on it.

The firm of Frenot & Bennett has been organized in Newark, N. J., and has established a plant at 160 Ferry St., for the manufacture of brass, bronze, silver and gold castings. It is also expected that electroplating will be carried on later. Both members of the firm were connected with Reinbold & Co., of Newark, N. J., the well known founders. The new firm will make only the finest grade of art metal work for the trade.

John Hassall, Inc., Clay and Oakland Sts., Brooklyn, N. Y., manufacturer of rivets, escutcheon pins and special wire nails, is making an addition to its plant. A plot of ground 75 x 100 has just been purchased for this purpose and which will now give them a frontage of 200 feet on Clay St. Their business has increased yearly for the past ten years and the year 1911 has been largest in the history of the company.

The Niagara Alkali Company, Niagara Falls, N. Y., manufacturers of pure electrolytic caustic potash and pure muriatic acid, announce to the trade that there has been a considerable drop in the price of potash and that they are now prepared to quote much more attractive prices on this material than ever before. Electroplaters and other manufacturers, who have found the potash of this company so satisfactory, should write for their new quotations. They supply potash in solid or liquid forms to suit all demands.

The following changes have taken place in the sales department of the Lumen Bearing Company of Buffalo, N. Y., and Toronto, Canada; H. F. Parrock, formerly Western representative has been appointed sales manager, succeeding Allen Kendall, resigned. H. F. Russell, formerly purchasing agent, has been made sales representative covering Central and Western New York and Eastern Pennsylvania. He has been succeeded by Albert Lockwood as purchasing agent. Louis S. Jones, for many years with the Prentiss Tool & Supply Co., has been made sales agent for New England. H. O. Schwaner is now Pittsburgh representative and Fred Ganderton, formerly with the Aluminum Castings Co., has been made sales manager of the Toronto plant. Alfred A. Greenburg, manager of the babbitt department, reports an extensive growth to the business.

Shreve & Co., of San Francisco, Cal., the largest manufacturing and retail jewelers in that city, have let a contract for a new four story building at Bryant St., near Fourth St.

The Northwestern Jewelry & Mfg. Co., has succeeded the Northwestern Jewelry and Gem Lapidary Co., of Billings, Montana. The manufacture and sale of jewelry is carried on.

The Thermos Stove Co., has been incorporated in Plainfield, N. J., with a capital stock of $100,000 to manufacture stoves, etc. Guy H. Hewitt, Theodore E. Johnston and others are the incorporators.

The Doylestown Aluminum Ware Co., has been incorporated in Doylestown, Ohio with a capital stock of $10,000 to manufacture aluminum cooking utensils. H. J. Heller, J. B. Meech, Peter B. Strobel and others are the incorporators.

A plant is to be built near Knoxville, Tenn., by the Aluminum Company of America of Pittsburgh, Pa., which will be used for the treatment of the bauxite deposits found there and which is the ore used for the manufacture of aluminum.

The Tabor Mfg. Co., of Philadelphia, Pa., the well known manufacturers of molding machinery, are now making the "Tabor Shockless Jarring Machine" for machine molding up to 50,000 lbs. capacity. The table on the largest size machine is 8 x 12 feet.

Robert J. Taylor, Inc., 19th. and Callowhill Sts., Philadelphia, Pa., the well known manufacturers of graphite crucibles and other graphite products, are sending out to the trade their calendar which they have placed among their customers for so many years. In the calendar they have followed the same custom that they carry out in the manufacture of their products. When satisfactory, no change will be made. They are firm believers in maintaining uniform quality in their goods.

The Munning-Loeb Company of Matawan, N. J., manufacturers of platers' and polishers' supplies, have recently issued a new catalogue of their "Optimus" plating dynamos. Two and three wire machines are illustrated, as well as belt driven and direct connected motor units. Test curves showing the performance of the machines are given in the back pages and in addition there is considerable information of a general nature for platers. The catalogue will be sent to those who desire it upon application to the Munning-Loeb Co.

The Page Woven Wire Fence Co., of Adrian, Mich., manufacturers of wire fence, are now manufacturing automobile windshields. Their shields are made of brass, but are characterized by having no brass castings upon them. All parts are made of either drawn brass or that formed from sheet and for which they claim superiority. They also call attention of the public to the fact that no parts of their shields are manufactured of sheet steel and brass plated, but everything is of solid metal.

The Brown Brass Co., of Napanee, Ind., has increased its capital stock from $10,000 to $20.000.

The Bressolo Wrench Mfg. Co., has been incorporated at Spring Valley, Ill., to manufacture hardware and tools. The capital stock is $99,000.

The American Brass Novelty Company, Grand Haven, Mich., are erecting an addition to their factory. The capacity of the plant will be doubled when the addition is finished.

The Mueller Mfg. Co. of Decatur, Ill., one of the largest manufacturers of plumbers' brass goods in the United States, is completing arrangements for the establishment of its new Canadian plant at Port Arthur, Ont.

The Scientific Materials Co., 717 Forbes St., Pitt sburgh, Pa., manufacturers and dealers in scientific instruments and supplies, are to erect a six story building for their own use in that city.

The Hamilton Company, 50 Church St., New York City, desire to announce to the trade that they are prepared to do lead burning for pickle tanks, etc. Prompt and satisfactory service will be given.

The entire output of crude platinum in the United States is obtained from Oregon and California mines. The production in 1910 was 390 oz., while in 1909 was 673 oz. A considerable amount of platinum and other rare metals are now obtained at the U. S. Mint in the electrolytic refining of gold and silver.

The Atwater-Kent Mfg. Co., Philadelphia, Pa., manufacturers of ignition specialties for automobiles, electrical goods and other metal wares, are to build a new brass foundry. They have purchased a tract of land on Stenton Ave., in that city upon which the foundry will be erected. A new manufacturing plant will also be built on the site. The present location of the company is at Sixth St.

A receiver has been appointed for Paul S. Reeves & Son, of Philadelphia, Pa., the well known brass and bronze founders. Clarence B. White has been appointed the receiver by the Court and is authorized to conduct the business for 60 days, after which a report is to be made to Judge Holland of the U. S. District Court. Paul S. Reeves & Son are one of the largest brass founders in the United States and have carried on a jobbing business exclusively.

The Marion Brass & Bronze Foundry has been organized in Marion, Ohio by C. J. Rath and the manufacture of brass, bronze and aluminum castings will be carried on. In addition, the manufacture of metal patterns, babbitt-metals, special alloys and ornamental work will be a specialty. Mr. Rath was formerly president and general manager of the Alliance Brass & Bronze Co., of Alliance, Ohio and is now conducting the new company under his own name. The plant has been equipped in the most modern manner and has a capacity of 50 tons per month.

The Abbott Motor Co. of Detroit, Mich., manufacturers of motor cars, has purchased a large factory site near the plant of the Lozier Motor Co., in this city, and in the spring will erect a new plant on it.

The Westport Mfg. Co., and Steel Plating Co., of Westport, Ont., Canada, are to move their office from that place to Ottawa and will also establish a small plant there. The plant will be situated on Wellington St.

The plant of the United States Bag Frame Company, 275 Broome St., Newark, N. J., was sold at auction recently and the factory has been closed permanently. Bag and trunk hardware were manufactured.

The Zucker & Levett & Loeb Co., of New York City which went into bankruptcy some time ago, has now been reorganized by the Levett interests and an office has been opened at 132 Nassau St., New York City. The company is now doing business at this address.

C. W. Leavitt & Co., 30 Church St., New York City, importers and agents for magnesium, metals and alloys, are sending out to their friends, a large calendar upon which is shown an illustration of a 15 ton "Girod" electric furnace for melting steel, and for which they are agents in the United States.

The Anderson Chemical Co., 92 William St., New York City, and plant at Wallington, N. J., are manufacturers of Amyl-Acetate, Refined Fusel-Oil, and Soluble Cotton Solutions for the lacquer trade. All these products are manufactures particularly for use in the manufacture and use of lacquers and the opportunity to make quotations is solicited.

The United States Chemical Co., Cleveland, Ohio, are now manufacturing the "Midget Voltmeters" which are only 2¼ in. in diameter. They register up to 8 volts in 0.2 divisions. This instrument sells for $1.25 and has a permanent type of tungsten magnet thoroughly aged. This low priced voltmeter should appeal to all platers who desire an accurate pocket instrument.

Manufacturers who use chemicals of any kind in quantities should ask McKesson & Robbins, 91 Fulton St., New York City, for quotation. They make a specialty of chemicals for platers and brass manufacturers. Cyanide, copper carbonate, bismuth, mercury, nickel salts, potash, zinc carbonate, cream of tartar and all other materials used in the metal trades are stocked in large quantities for immediate shipment.

The United States Sherardizing Co., New Castle, Pa., C. J. Kirk, president, have just issued an interesting pamphlet entitled "About Sherardizing." The pamphlet contains 39 pages and comprises a history of the sherardizing process, patents, and methods of applying. The results of many tests are also given and the information given will be found of much interest to those who have occasion to deal with the application of rust-proof coatings to iron and steel.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.19
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.07⅞
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.14¼
Copper, Lake, (cask)	lb.	.14½
Copper, Electrolytic, (carload)	lb.	.14¼
Copper, Electrolytic, (cask)	lb.	.14½
Copper, Casting (carload)	lb.	.14
Copper, Casting, (cask)	lb.	.14¼
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	3.50
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.46½
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.45
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	25.00
Platinum Metallic	oz.	46.30
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.53¾
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.42½
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.06½

THE BRASS WORLD AND PLATERS' GUIDE

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Contents for February.

Alloys of Copper, Zinc and Silicon, New... 65
Anodes, Alloyed Zinc 47
Automobile Radiators, Corrosion of 55
Brass Foundry Mixtures 41
Brass and Bronze Plating Solutions 49
Brass Melting Furnaces in England 66
Canadium, a New Metal 59
Composition Ingot, Specifications for 51
Copper, Absorption of Gases by 62
Core Testing Machine, A 61
Cupola, Melting Bronze in a 57
Die Castings 39
Die Casting Machine, New 66
Drying-Out Process, a New..... 60
Electrogalvanizing Solution, New..... 62
"Fire-Coppering" Iron or Steel 65
Furnaces, New Crucible 59
Galvanizing Process, New 48
Gas vs. Electric Furnaces for Melting Gold and Silver 48
Gas for Melting, High Pressure 54
Gold, Making Fulminate of 57
Lampblack Is Made, How 67
Lead, Separation of Dross from..... 63
Nickel Deposits, Stripping 53
Nickel on Nickel, Depositing 53
Nickel, Deposition of Black 56
Nickel Plating Aluminum 58
Plating Racks, Some Modified 64
Silver Deposit Process, New 54
Spotting-Out, Notes on 40
Welding Aluminum, Flux for 51
Welding Copper 55

Die-Castings.

Nothing pertaining to the art of casting metals is receiving more attention at the present time than the so-called "die-castings." By die-castings are meant those which are cast in a steel mold, accurately machined so that the finished casting will require no work on it. From a manufacturing standpoint, this is a very important matter as it is possible, by means of the process to cast finished shapes that would be very expensive had they to be made by regular machining.

Die-castings, however, are limited to comparatively soft alloys and those used consist principally of zinc with small quantities of other alloys for hardening. On this account, the field for the castings is more or less limited, although there are a number of concerns now making them and many manufacturers using them. The fact that no machine work is necessary renders die-castings very attractive.

Die-castings are, no doubt, over-rated on account of the comparatively weak alloy used in making them. There are manufacturers using them who should not as they are injuring their reputation by doing so. The castings are not suited for the goods they make. Other manufacturers, without a doubt, should use them, but do not.

As now produced, die-castings are excellent examples of the casting art, but the metal leaves much to be desired. It is one of the difficulties which seems to be without solution at the present time for the reason that in order to make the castings, a metal or alloy that melts at a low temperature (below a red heat)

must be used, and at the same time, it must not shrink excessively so that it will tear itself apart in the mold. The zinc base alloys or the tin or lead base alloys are the ones that must be employed for the purpose. The lead base alloys are quite soft and weak and cannot be used for many purposes. The tin base alloys are stronger, although not sufficiently hard for the majority of instances. They cast exceptionally well, however, and for many purposes are especially suitable. The zinc base mixtures are the hardest and the most extensively used. They have the additional feature of being cheap.

Brass has been produced in the form of die-castings, but they have not met with any success at all for the reason that the shrinkage of the brass is so great that the castings almost invariably crack. This is particularly true of all except the simplest shapes and it is usually such castings that are not demanded in the form of die-castings as they can be made on screw machines or in a similar manner from rod, wire or sheet metal.

"Spotting-Out"; The Greatest of Electroplating Obstacles.

Of all the obstacles encountered in electroplating, it is believed that the difficulty known as "spotting-out" is the greatest. Those who have to deal with wire or sheet metal goods are not troubled with it to any extent, neither are those who nickel plate castings; but platers who have as their work the copper or brass plating of iron or brass castings will always have to contend with it.

The cause of "spotting-out" is simple. The plating solution penetrates the porous portions of the castings, and after it has been finished gradually oozes out, and coming in contact with the air, liquifies and stains the metal deposit. All castings are porous, either from blow holes, spongy spots, or cracks and until perfect ones are made, the plater will always have the "spotting-out" difficulty to overcome.

There is another cause of "spotting out" which frequently occurs on copper or brass plated sheet steel goods and this is one produced by the blistering of the deposit. The blisters hold solution underneath which finally works out, after the work is finished, and stains the metal around them.

The "spotting out" of castings as previously mentioned, is caused by the plating solution working out of the porous portions of the metal. The problem, then, is to remove this solution from the pores. It is now firmly believed that there are many cases of spotting which may be cured by a good soaking in hot water. The ordinary rinsing which is given the regular run of plated work does not suffice to remove the solution as will be readily appreciated when one stops to think that the rinse water serves only to take off the solution on the surface. A prolonged soaking in hot water (better still is water that actually boils) will frequently serve to wash out the plating solution from the interior of the porous places.

Rinsing in acid or baking will not suffice to remove the solution in the pores, and the method very extensively used in large establishments of Connecticut is to rinse the work thoroughly, and then allow it to remain without finishing for a time. Several weeks time are frequently given the work in cases of bad castings. This lapse of time gives the plating solution ample time to work out. After that the work is finished by buffing or dipping and no further "spotting-out" occurs.

It is believed that the potassium salts in cyanide plating solutions is the cause of the obstinate cases of "spotting-out". It is a well known fact that potassium salts are deliquescent; that is, they absorb moisture from the air and become liquid. They liquefy instead of dry up. Therefore, the potassium compounds in the plating solution, as they ooze from the pores, liquefy and do not dry on the surface, with the result that the solution spreads out and forms a spot. In the case of sodium salts, which have the property of giving up their moisture, instead of liquefying and forming a round spot on the surface of the work, they dry up and may be brushed off. We do not wish to convey the idea that the use of sodium salts will obviate "spotting-out", but that theoretically they will lessen the difficulty; and experience has shown this to be true.

Banquet of National Electroplaters' Association.

Full information in regard to the Banquet of the National Electroplaters' Association, held in New York City, on Saturday evening Feb. 10th, 1912, will be given in our March issue, and the papers read will be published.

Standard Brass Foundry Mixtures and Method of Making Them.

By Erwin S. Sperry.

The non-ferrous metal mixtures used in the brass foundry may be divided into three classes:

1. Red Metal Mixtures.
2. Yellow Metal Mixtures.
3. White Metal Mixtures.

The red metal mixtures are, by far, the most important of the three classes for the reason that they are employed for the production of the best class of castings that can be made in sand. The yellow metal mixtures are generally used because they are cheap, al-

Fig. 1. Example Indicating Application of Statuary-Bronze. Bronze Statue of a Molder. Statue Made in Vienna, Austria-Hungary.

though the yellow color may be required for ornamental work; in the case of the manganese-bronzes, which, strictly speaking belong to the yellow mixtures, strength, and not color or cheapness is required. The white metal mixtures must be sub-divided into two classes: The soft metals with a tin, lead or zinc base, and the nickel alloys. Both classes form the less important portion of the product of a brass foundry.

The mixtures used in the brass foundry are frequently unnecessarily complicated by too great a variety. It is imperative, however, that the mixture shall be adapted to the casting, and while a large number of mixtures invólves too much detail and too much care in sorting the scrap in the form of gates, the number cannot be cut down to the limit usually found in the small jobbing brass foundry where two mixtures only are known—red and yellow. The brass foundry which limits its mixtures to this number, rarely has a reputation for its work. When cheapness is paramount and scrap metals are employed exclusively, then there is no reason why more than two mixtures should be used, and were this invariably the case, there would be no demand for any at all. However, it has now become customary for large users of scrap metals to specify the mixture which they shall contain, so that even when new metals are not employed, the demand for a specific mixture may still be necessary.

Proportions of the Metals.

In giving the various brass foundry mixtures, the custom has been adopted of using pounds and grams, instead of percentages and as the total weights amount to 100, if desired, one may read per cent instead of pounds. The object of this procedure is to avoid confusion in the case of the average brass founder who is not familiar with other methods. The object of using the metric system in addition to pounds, is to render it easy for those who use this system to interpret the proportions of the various metals.

The old custom of using one pound of copper and so many ounces of the other ingredients, is fast becoming obsolete and is not to be recommended. While it may be satisfactory in the case of such a mixture as "Ounce Metal" (practically ordinary "Composition" which is made by taking 1 lb. of copper and 1 oz. each of tin, lead and zinc, it is very unsuitable for many other mixtures. The brass founder can obtain any weights from the mixtures used in this article by a simple division, and it is believed that such a method is the best.

The functions of the various metals in the red metal mixtures are as follows:

Pure copper is too soft for castings and requires hardening if it is to be used. Tin possesses the property of hardening copper in proportion to the amount introduced into it. By varying the amount of tin, with which the copper is alloyed, the hardness of the mixture may be increased or decreased as desired. To make a hard mixture, the tin is increased. To soften it, less tin is used.

When copper and tin are used alone in making castings, the results are apt to be unsatisfactory on account of the tendency of the tin to "sweat-out" in the form of drops or the well known hard "tin spots." This phenomenon is known by two names—liquation or segregation, depending upon the character of the imperfections in the castings. Blowholes are another difficulty encountered in casting the copper and tin mixtures in sand.

In order to overcome these obstacles, it is necessary to introduce some other metal into the copper and tin mixture which has a strong deoxidizing property. Zinc answers this requirement well and is invariably employed unless some special mixtures are to be made. It has the property of reducing the oxide of copper formed in the melting of the mixture, thus promoting soundness in the casting, and is also cheap which is quite advantageous.

A mixture composed of copper, tin and zinc, while strong, hard, and casts well, does not cut readily. It is too tough to machine nicely as the chips are long and stringy and it resembles wrought iron to a certain extent. This fact, of course, applies to the ordinary red metal mixtures containing less than ten per cent of tin and which constitute the greater proportion of the mixtures in daily use. Such tough metals do not cut satisfactorily as the speed of the machine must be slow and the output is necessarily limited. When such metals are machined, the workmen call them "hard" and this is a term that has crept into general use. A mixture that is actually so soft that it can be bent double, will be called "hard" by a brass finisher for the reason, it is presumed, that the metal cuts with difficulty or "hard." The term "tough"

would be better, but brass finishers do not use it and the name "hard" is invariably employed to designate the condition of the metal.

To render the mixture free cutting or "soft," lead must be used in it and it is for this purpose that this metal is introduced into the red metal mixtures. The more lead that is introduced into the mixture, the more freely will the casting cut under the tool; and at the same time, the weaker it will be. Except for bearings, the amount of lead used in the red metal mixtures rarely exceeds 5 per cent as the castings are then too weak for ordinary work and the lead is apt to "liquate" or "segregate." Even with 5 per cent, difficulties are frequently encountered and it is preferable to use less. When lead is used in the mixture, the chips from the cutting tool are short and break off readily; so that a much higher speed may be used in machining and the tools remain sharp longer. Lead, therefore, is used to produce a mixture that will cut freely.

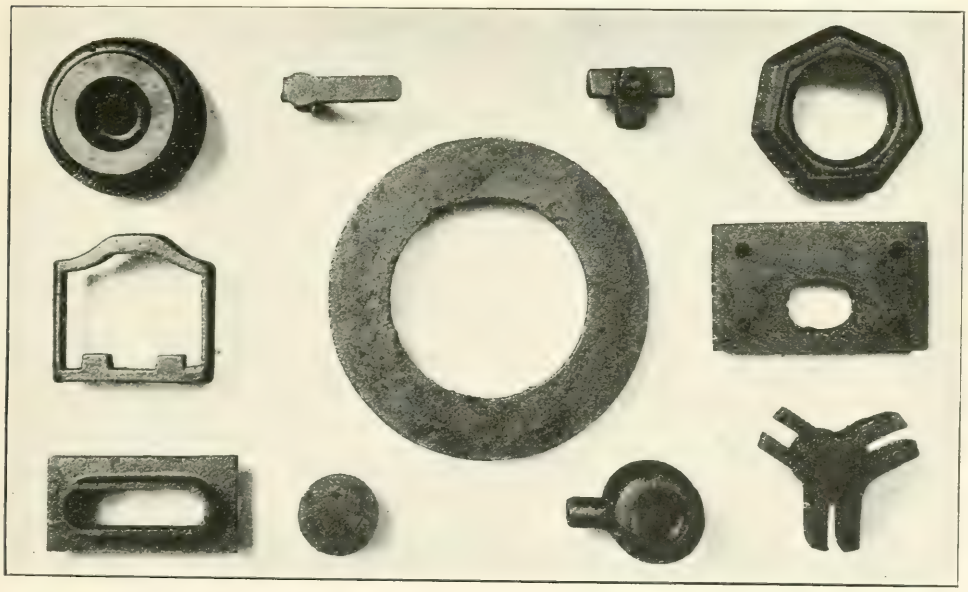


Fig. 2. Examples of Ordinary Composition Castings Used in the Brass Foundry Trade. Any Casting That is Red is Usually Called Composition.

The Raw Metals

As a general rule, brass foundry mixtures, do not require as pure metals as those employed in making brass sheet, rods or tubing. The demands upon the finished product are not as great. For the majority of work, the cheapest of the commercial grades of copper, tin, zinc and lead are used.

The grade of copper known as "Casting Copper," is almost exclusively used in the brass foundry trade. It contains small quantities of impurities which unfit it for use in the brass rolling mill trade and in the manufacture of copper wire. These impurities are usually iron, antimony, arsenic and traces of sulphur. As a usual rule, they are not present in a sufficient quantity to injure the castings made from the copper, but iron is often contained in it to such an amount that the castings will have a black color. Such copper is unfit for use.

Electrolytic copper is now extensively used in the brass foundry trade, and while it costs a little more than casting copper, it is usually very pure and never gives any trouble. Whenever possible, it is recommended. Lake Superior copper is the most expensive variety and is very rarely used in the brass foundry on account of its cost. It is the purest and most expensive of any of the grades.

Scrap copper is also extensively used in the brass foundry trade, and if of the right kind,

it is recommended. Copper wire is always very pure, otherwise it could not be rolled or drawn into wire. Trolley wire is the best as it is the heaviest form. Large coils used in motors or dynamos are also good. Small wire should be avoided as it oxidizes too much in melting and causes pin-holes in the castings made from it. Wire having rubber insulation (either on or having been burned off) should be shunned as it contains sulphur absorbed from the rubber and is brittle and will produce pin-holes in the castings. Old copper bottoms, sheet clippings and other small scrap copper are not very good as they present too much surface to oxidation when melted. Copper should *always* be in as large a mass as possible, and ingot copper will always produce better castings than those made from wire.

The tin used may be any of the grades of "virgin" metal. Tin made from old block tin pipe, solder dross, white metal skimmings, or other scrap material cannot be depended upon as it is very apt to contain antimony and lead. The so-called "Straits-Tin" is the best and can be relied upon. "Banka-Tin" is the purest variety but it costs more than the other grades and is not worth the price for brass foundry use.

Any of the grades of "Virgin Spelter" are suitable as long as they are made from zinc ores. The impurities are iron and lead and the amount, unless the spelter is to be used for a particular purpose, is not injurious. Highly refined spelter, except in special instances (like the production of manganese-bronze) is unnecessary. Spelter made from scrap, skimmings or drosses is to be used with precaution as aluminum is used in the refining of such materials and some remains in the metal. Brass founders well know the disadvantage of aluminum in red mixtures, and it is quite undesirable.

The best lead found on the market is known as "desilverized" and is really the soft refined lead of commerce. One grade of lead usually costs about as much as another, and the quality is not of much importance. Any good grade of lead that is soft will answer. Old lead pipe is frequently used and gives good results. The lead is the metal that needs the least attention of any of the ingredients of the brass foundry mixtures. Hard lead should always be avoided as it contains a large amount of antimony.

Composition.

The term "Composition" is one generally employed in brass foundry language to designate any metal that is red, casts well and cuts freely. If it answers these requirements and is red, then it can be called "Composition." There really is no standard mixture for it, but the old-fashioned "Ounce-Metal" which has been used for many years probably comes as near to conforming to it as anything can. "Ounce-Metal" is made by taking 1 lb. of copper and 1 oz. each of tin, lead and zinc.

Mixture for Composition.

Copper	85 lbs. or	850 grams
Tin	5 lbs. or	50 grams
Zinc	5 lbs. or	50 grams
Lead	5 lbs. or	50 grams
Total	100 lbs. or	1000 grams

Another term for composition is one often heard and which is, from a brass foundry standpoint, quite modern. It is designated as "Eighty-five and three fives," referring, of course, to the proportion of the metals in it.

Owing to the high price of tin, the preceding mixture for composition is higher in cost than frequently desired; and at the same time it contains more lead than it should for the best class of work. It has now become a custom to demand very high grade castings of composition on account of their excessive cost, when compared with the yellow mixtures, and the brass founder, therefore, is called upon to demonstrate his skill in this direction. It is advisable, accordingly, to use less lead in the mixture, although the preceding formula for composition has been in very extensive use for many years and is still largely used. Many brass founders prefer the following as it is cheaper, has the same color and is stronger. For cheap valve parts and analagous work, the first composition mixture is preferable, however, as it shrinks less and cuts exceptionally freely on account of the amount of lead it contains. This second composition is employed and gives very satisfactory results for practically all classes of work in which composition would be employed.

Cheaper Composition Mixture.

Copper	85 lbs. or	850 grams
Tin	3 lbs. or	30 grams
Zinc	9 lbs. or	90 grams
Lead	3 lbs. or	30 grams
Total	100 lbs. or	1000 grams

Composition* is by far, the most important of the red metal mixtures and is more extensively used than any other; but yet if one should ask the average brass founder what the proportions of the metals in it are, he probably would not be able to answer. This apparent paradox is brought about by the fact that a very large proportion of the composition made into castings is composed of scrap. Red metal scrap is very rarely unsatisfactory and for this reason is extensively employed. Therefore, the brass founder never knows what he has in the shape of a mixture. As previously mentioned, the requirements of composition are that it shall be red, cast well, cut freely, and be stiff enough for ordinary purposes. Scrap answers these requirements in a remarkable degree and brass founders now purchase more scrap than ever before. When they do make composition from new metal, they usually make it not far from the second mixture previously given.

The uses of composition are very numerous, and to ask what they are would be equal to proposing the question of what the uses for brass are. Composition is used for making the numberless varieties of small castings made in the brass foundry. There is no particular use that can be claimed for composition other than for "making sand castings."

Statuary Bronze.

Of all the red metal mixtures, "Statuary-Bronze" must be made with the most care. There is no class of sand casting that requires such skill in making. Not only is the labor the most skilled of any employed in brass founding, but it is not infrequent to consume months in completing a sand mold of a large statue. It will readily be appreciated that with such an enormous expenditure of labor, makers of bronze statuary cannot afford to economize in the metal they use; and for this reason, scrap metals are *never* used in the making of statues. Not only is the best mixture known for the purpose employed, but the very best of metals obtainable are selected. The object is to avoid to the fullest possible extent, the introduction of any factor of uncertainty.

For a bronze statue, the mixture must run as sharp and thin as possible so as to fill the mold without chilling and allow the finest impression to be reproduced. The mixture must also be strong and tough to stand rough

Fig. 3. Trolley-Wheel, Showing Application of Mixture for This Class of Work.

usage. It must work fairly well under the chasing tools. The color, too, must be of standard bronze. The mixture which answers these requirements and which is used by the leading makers of bronze statues, is as follows:

Statuary Bronze Mixture

Copper	90 lbs. or	900 grams
Tin	6 lbs. or	60 grams
Zinc	3 lbs. or	30 grams
Lead	1 lb. or	10 grams
Total	100 lbs. or	1000 grams

The small amount of lead is required to impart the necessary chasing qualities to the statue. A large amount of chasing is always done upon it, and unless the lead is introduced into the mixture, the metal would be too tough to cut freely.

It can really be said that the preceding "statuary-bronze" mixture is the best that can be used for any other sand casting work in which the finest castings are desired. It has

*The first mention of the name "Composition" in connection with red metal castings is, as far as known, in the U. S. Patent No. 38,301 April 28, 1862 issued to Moses G. Farmer in which it is applied to ordinary castings.

excellent casting qualities, is hard and yet not brittle and will stand much bending without fracture. If one desires the *best* mixture for making an ordinary red metal casting, then let the "statuary-bronze," be employed. If a good casting cannot be made from it, then the mixture is not at fault.

Trolley Wheels.

Trolley wheels are one of the comparatively new arrivals in the brass foundry trade and their advent took place with the beginning of the electric railroad. Although it is now quite a number of years since trolley wheels were first used, brass founders are generally not familiar with the requirements of this special branch of the business. Many believe that any composition casting is good enough and all that is required is some mixture that is red. This is far from the truth and unless a suitable mixture is employed, the wheels will not give as much service. The object of using a suitable mixture in a trolley wheel is to give it the maximum amount of wear and ordinary composition with its large amount of lead is short-lived. For some reason not understood, perhaps, lead, although it makes a good bearing, is unsuited for an ingredient in a trolley wheel. It is probably the arcing which takes place between the wheel and the trolley wire that causes this apparent paradox, but experience has demonstrated it to be true.

The best mixture for trolley wheels is the following:

Mixture for Trolley Wheels

Copper	92 lbs. or	920 grams
Tin	6 lbs. or	60 grams
Zinc	2 lbs. or	20 grams
Total	100 lbs. or	1000 grams

No lead is used in the mixture. It has been demonstrated that this mixture gives a far greater mileage than one which contains lead. While this mixture is advantageous and is very extensively used for trolley wheels, it is rather expensive for the reason that it must always be made of new metals. It is practically impossible to obtain scrap red metals on the market that are free from lead, otherwise it would be possible to use some scrap at least. If a cheaper trolley wheel mixture is desired, then ordinary composition can be used, but such wheels will wear out much more rapidly than those made from the preceding one. This mixture is a standard one, and should be employed wherever the best results are desired.

Trolley Fittings

It seems to be a rule of the electrical trades that all castings shall be red, presumably on account of the fact that so much copper is employed in such work and the castings must match the color of this metal. While a trolley wheel is the most important of any of the trolley fittings, there are a number of other devices used in conjunction with it that must be made in the brass foundry. These are: Trolley ears, clips, frogs, harps, and similar appliances used for holding the trolley wire or the wheel itself. The requirements of such fittings are not as severe as those of the trolley wheel itself and any *good* red metal will answer. The castings must be strong, however, and too much lead is a disadvantage on this account. The most satisfactory mixture for the purpose is the second composition mixture previously given. It is strong and tough and does not become brittle when heated by a gasoline torch for soldering as the mixtures high in lead will do. This mixture is as follows:

Mixture for Trolley Fittings

Copper	85 lbs. or	850 grams
Tin	3 lbs. or	30 grams
Zinc	9 lbs. or	90 grams
Lead	3 lbs. or	30 grams

Trolley fittings are always machined to a certain extent and the lead is necessary to impart the requisite cutting qualities.

Pattern Metal

The gated patterns used in the brass foundry are invariably made of red metal (if not they should be as yellow brass is not at all satisfactory) and the requirements are more or less severe. There are few foundries that can make a good pattern casting as it requires not only the best kind of metal, but the finest kind of mold work. It is customary in making such molds to use Windsor-Locks sand (or its equivalent) for facing the mold, after which it is "skin-dried" and smoked. The object is to obtain the smoothest surface on

the casting and have it run as sharp as possible. Much care is required, too, in molding to avoid "rapping" the pattern too much, or in pouring not to force the metal, otherwise the castings may be too large. A metal pattern maker wants his castings made so that all he

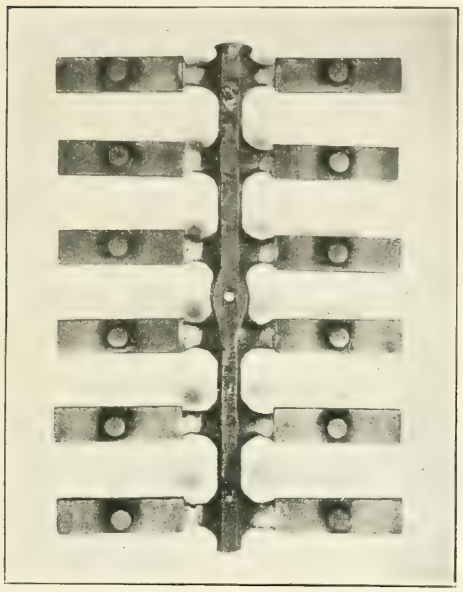


Fig. 4 Gated Pattern, Indicating Application of Pattern Bronze.

is obliged to do is to clean the surface, and if he has to file them down to size, a large amount of unnecessary labor is involved.

In order to obtain such perfect castings, the mixture used for making them must be adapted for the purpose. It must not be too hard or the pattern maker will find fault with the way it works. It must not be brittle as it is frequently subject to rough usage by a molder who uses it. It must fill the mold as sharp as possible, and work well when filed or cut. The following mixture has been found very satisfactory for the purpose:

Mixture for Pattern Castings

Copper	80 lbs. or	800 grams
Tin	8 lbs. or	80 grams
Zinc	2 lbs. or	20 grams
Lead	2 lbs. or	20 grams
Total	100 lbs. or	1000 grams

It is necessary to use good metals in making pattern bronze and when this is done, and the molding carried out as previously described, the castings will come out of the sand bright and clean without any sand burned on the surface; and at the same time, in a condition that will require the minimum amount of labor in finishing.

The making of pattern castings, however, is a matter that calls for the utmost skill in brass molding, provided a job is done that a pattern maker will call "satisfactory" and instances have been known in which those who make a specialty of such work have been able to obtain $1.00 a pound for small castings for gated work. Metal pattern makers usually believe that it pays to purchase such castings as it is saved many times over in the labor of finishing. It is not a business, however, from a brass founders' standpoint that makes it attractive as the amount of business is quite small.

(To be continued in the next issue.)

Alloyed Zinc Anodes.

According to a German patent issued to L. Sänger (240,630, Oct. 23, 1910,) an alloyed zinc anode gives superior results in electrogalvanizing. The following are claimed:

	(1)	(2)	(3)	(4)
Zinc	98.50%	97.00%	97.00%	96.00%
Lead	1.20%	1.50%	1.00%	1.50%
Iron	0.20%	0.50%	0.50%	0.50%
Copper	0.10	none	none	none
Tin	none	1.00	1.00%	1.50%
Carbon ...	none	none	0.50%	0.25%
Aluminum .	none	none	none	0.25%
Total	100.00%	100.00%	100.00%	100.00%

It is claimed that zinc anodes made of any of these alloys are more durable than ordinary zinc when used for electrogalvanizing as they preserve their form* until reduced to the "thinness of paper."

* It may be possible that an alloyed zinc anode is preferable to a pure zinc one, as it is now well known that an alloyed nickel anode is far superior to one of the pure metal. Lead, however, is usually considered deleterious in a zinc anode as it forms an insoluble coating on the surface.—*Editor.*

A New Hot Galvanizing Process.

A new hot galvanizing process has recently been patented* by Prof. Chas. F. Burgess of the University of Wisconsin, Madison, Wis. which differs from any other process heretofore in use in that an alloy of zinc and iron is used for the coating instead of pure zinc as generally employed. These patents have been assigned to the United States Sherardizing Co. of New Castle, Pa.

The process consists in using an alloy of zinc and iron for coating the iron or steel goods to be galvanized. This alloy is made by allowing thin sheet iron to dissolve in molten zinc until an alloy of about 92% zinc and 8% iron is obtained. This alloy is quite brittle and is powdered or granulated.

The articles to be galvanized are placed in an iron tumbling barrel with this zinc-iron alloy in the granular form and heated while the tumbling is going on. The heat is maintained at about 850° F. The heating is continued for two hours or more. It has been found expedient in the process to supply zinc so that the iron content of the alloy will not increase. Zinc dross (containing about 3% of iron) is, therefore, introduced in to the barrel in the form of large lumps and the tumbling allowed to proceed. These lumps become readily broken up in the hot barrel and mix with the granulated zinc and iron alloy.

The coating of zinc and iron alloy obtained on iron and steel goods by this process is, the inventor says, very dense and silver-white in color. It is electropositive with respect to iron, but not to the extent that pure zinc is. The inventor says that this is quite an advantage as the coating, when exposed to the atmosphere, is not corroded as rapidly as zinc, and yet it protects the iron or steel underneath equally as well.

If desired, the zinc and iron alloy may be made by using zinc dross entirely and placing it in the barrel along with the goods to be galvanized. The heat and tumbling break up the lumps. To supply the iron, small pieces of scrap iron are introduced with the zinc dross.

*U. S. Patents Nos. 1,014,749 1,014,750 1,014,751 and 1,014,096, January 16th, 1912.

Gas vs. Electric Furnaces for Melting Silver and Gold.

According to a report recently issued by E. Rigg, superintendent of the Royal Mint of London, England, experiments on the use of gas and oil in melting bullion have been carried on since early in 1909. Many new furnace designs were made and many burners for obtaining high temperatures were tried, some being especially made while others were those already in use in furnace construction.

Electric furnaces were also tried out and, it is stated, that even were the cost of operation not prohibitive, this type of furnace does not lend itself to the melting of the precious metals where, for accounting purposes, the entire charge must be recovered daily. It is also stated that it is impossible to stir the metals thoroughly.

In the new silver melting house, which was put into operation in February 1911, there are 16 gas-fired furnaces, each capable of taking a 400 lb. crucible and fitted with the Brayshaw burner. These furnaces have a maximum capacity of 2¾ tons of sterling-silver or 2¼ tons of bronze per melt; and four such melts of silver or three of bronze can be made in an ordinary working day of 10 hours.

The substitution of gas for coke was accompanied by considerable economy. When gas is used, the charge for fuel averages about 9 cents (4½d) per 100 lbs. of gold bullion melted, as against 14 cents (7d) when coke is used. With these figures, the cost of warming the furnace in the morning is omitted, but even if this be included, the cost rarely exceeds 10 cents (5d) per 100 lbs. on a day's work.

A novel method of overcoming the heating of a locomotive journal bearing was recently described in a trade journal. The brass bearing continually ran hot. The bearing was raised from the axle and a piece of thin sheet lead inserted between the two. The axle was then lowered onto the bearing and allowed to run as usual. The lead was thus worked into the pores of the brass and the heating of the brass ceased. The efficiency of lead in a bearing thus becomes apparent.

Brass and Bronze Plating Solutions and How to Make Them.*

Second Paper.†

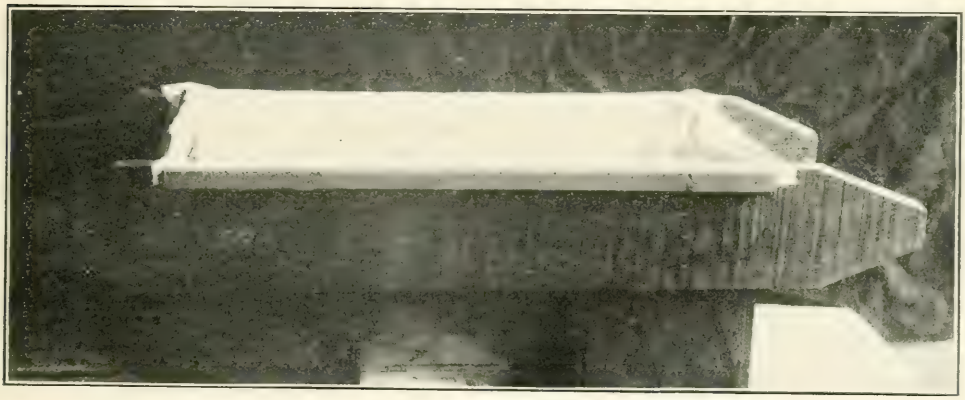
Making the Carbonates.

In making brass or bronze plating solutions, the carbonates of copper and zinc are used as the raw materials supplying the copper and zinc. The use of the carbonates is now practically universal as they have been found satisfactory. The use of the cyanides of copper and zinc, as frequently recommended, has not shown any better deposits than those obtained with the carbonates and they are far more expensive and troublesome to make. The acetate of copper (verdigris) is often used, but it has never been demonstrated that it gives any better results and costs more than carbonate of copper. Other salts have also been recommended, but the carbonates are the compounds that have proved to be the most satisfactory, both in cost and results.

The old method of making up a brass solution was to use the sulphates of copper and zinc and dissolve them in cyanide, but this has now become obsolete and should never be used. To be sure, a brass or bronze plating solution can be made in this manner, but it will work well only for a short time. When the sulphates are dissolved in potassium cyanide, potassium sulphate is formed by the reaction and this remains in the solution as an inert salt. It is not particularly soluble in water and is apt to crystallize out on the anodes and tank when there is a slight drop in temperature or the solution becomes stronger by evaporation.

Those who use large quantities of carbonate of copper and zinc will find it more expedient and cheaper to purchase them from those who make a specialty of manufacturing them and who have special appliances for producing them. In such establishments, it is customary to precipitate the carbonates in a large vat, filter out the precipiate, wash it and then transfer to a filter press and squeeze out all the moisture. It is then dried. If "plastic" carbonate is desired, the pressed material is shipped without drying.

In case small quantities are desired, or the plater may wish to make his own carbonates, then the following method of procedure may be followed:



Home-Made Filter for Filtering the Carbonates of Copper and Zinc.

Making Carbonate of Copper.

Sulphate of copper is used for the source of copper. This is also called blue-vitriol or blue-stone. Ordinary carbonate of soda is used to precipitate the carbonate of copper from it ("throw" it down). Carbonate of soda is also known as sal-soda and frequently washing-soda. Soda-ash is also carbonate of soda but is dry. Ordinary sal-soda of commerce is in the form of glassy crystals when fresh, but upon exposure to the air, these dry out to a white powder, but which in no way injures it. Either the soda-ash or the sal-soda may be used for precipitating the carbonate of copper.

*Continued from THE BRASS WORLD, January, 1912, page 21.

†These papers will be continued for a number of months.

The precipitation may be carried out in any convenient vessel that will stand hot water. A pail, stone-crock, or barrel may be used, depending upon the amount of carbonate to be made. The sulphate of copper is dissolved in the water in the following proportions:

Water	1 gallon
Sulphate of Copper	8 oz.

The sulphate of copper is dissolved in hot water. If a barrel is used, then a steam pipe can be run in it. At any rate, all the sulphate of copper must be dissolved before the precipitation can take place. The solution must also be as hot as possible or the precipitated carbonate of copper will be too voluminous and will not settle or filter readily. When the solution is hot, the precipitate will be dense and settles and filters readily.

The sal-soda or soda ash is dissolved in hot water in as strong a solution as it is possible to make. This is done in a separate pail or other vessel. The proportions need not be exact, but it should be strong. About 2 lbs. of the sal-soda can be dissolved in 1 gallon of water, or more if the water is quite hot.

When the sulphate of copper solution is in the barrel or other receptacle, and is as hot as it is possible to obtain it the temperature should not be less than 180° F. and the hotter the better as the carbonate of copper is then denser and settles better. Make a flat, wooden paddle for stirring the solution.

Now add the sal-soda solution to the sulphate of copper solution, little by little and with constant stirring. If too much is added at once, the bubbles of carbonic acid gas that are given off will cause the solution to boil over. For this reason, the vessel in which the precipitation takes place should not be more than three-quarters full. The complete precipitation may take some time on account of the caution that must be observed in adding the sal-soda solution to prevent boiling over. When no more effervescence takes place, no more sal-soda solution should be added. It may be well to state at this point that the sal soda or soda ash (whichever may be used) should *never* be added to the sulphate of copper solution in the dry condition, but it must always be dissolved in water.

When a sufficient amount of the sal-soda solution has been added, known, as previously mentioned, by the stoppage of the effervescence, the green, precipitated carbonate of copper is allowed to settle. If the precipitation has been conducted while the solution is quite hot, the carbonate of copper will settle rapidly and in an hour will have sunk so that there is about half clear solution at the top, and half precipitated carbonate of copper. If the precipitation has been conducted with too cold a solution, the settling will take place very slowly and the precipitate will nearly fill the vessel, even after some time.

The clear solution is now siphoned off with a hose, or bailed out and clean water added (preferably hot, as the washing is then more thorough), the whole stirred up and allowed to settle. The clear solution is again run off and the addition of clean water again made. This operation is repeated five times, when the majority of the sulphate of soda in the solution (which is the foreign matter to be washed out) will have been removed. Now bail out the carbonate of copper and place on a filter made according to the illustration herewith shown. This is simply a box with the bottom removed. A layer of cloth is tacked on the top and into this the carbonate of copper is poured and the water allowed to drain off from it. Pour hot water over the carbonate while on this filter and all the liquid has run off. This is allowed to run through the filter until the carbonate is drained, and after several washings have been made in this manner, the carbonate is finished.

The carbonate of copper now on the filter is in the form of a green, pasty mass and can be dried if desired, although this is usually unnecessary as it dissolves better if kept moist. Carbonate of copper that has been precipitated from a cold solution will, if allowed to dry, contract into hard lumps that dissolve in cyanide with much difficulty. It is advocated that it be kept in the moist or so-called "plastic" condition as it does not spoil and dissolves in this condition in a cyanide solution with the greatest ease. The water should be completely drained out of it, however, in order that it may be as compact as possible.

Making the Carbonate of Zinc.

To make the carbonate of zinc, take the following:

Water	1 gallon
Sulphate of Zinc	8 oz.

Precipitate it in exactly the same manner as that prescribed for the carbonate of copper.

Sal-soda or soda-ash is used for the precipitation and must first be dissolved in water. It is even more imperative, however, that the precipitation be carried out with the sulphate of zinc solution as hot as possible, for the reason that, unless it is quite hot, the sulphate of zinc does not settle nor filter at all well. The siphoning off of the clear solution after the precipitation has been finished, the washing and the filtering are all carried on as before.

The carbonate of zinc thus produced should, by all means be kept in the moist (plastic) state as it frequently dries in the form of hard lumps which do not dissolve in cyanide readily. Unless the precipitation has been carried out quite hot, this is sure to happen.

(To be Continued)

A New Flux for Welding Aluminum.

In welding aluminum by the oxy-acetylene blowpipe, it is necessary, in order to obtain the best results, to use a flux on the portions to be welded. This flux answers a two-fold purpose:

1. It protects the metal from oxidation when melted by the blowpipe flame.
2. It serves to dissolve the oxide formed on the surface of the molten metal.

According to a process recently patented by the Aktien Gesellschaft für Autogene Schweissung, of Zurich, Switzerland, the following flux is excellent:

Potassium Chloride	60 parts
Cryolite	6 parts
Calcium Chloride	30 parts

These proportions may be varied, if desired, but the quantities given are used for ordinary work. The best results are obtained by melting the whole together and then pulverizing before using on the aluminum. This will give a homogeneous mass of the flux which will melt more evenly.

Owing to the limited demand for metallic cadmium, very little is now produced in the United States. One of the large zinc smelters produces a small amount as a by-product in zinc smelting, but with this exception, none is now produced in the United States.

Specifications for Composition Ingot.

By A. P. Ford.*

The following specifications for composition ingot are believed to be practical and just to both buyer and seller. Too often specifications of all kinds are rendered ridiculous because they are *invented,* rather than based on actual results that are known to be typical. In order to guard against anything of this kind, five different shipments from three or four manufacturers, were used as a basis. These, as well as others from the same sources, had given satisfaction and were not exceptional in any way. In all, about 175 separate determinations were made.

In the first place, it was necessary to know how and where to take the fewest drillings that would represent the truest average of the ingot. The most commonly accepted method was to drill a hole clear through the ingot from top to bottom. This makes a lot of drillings and as only a very small portion is used in the actual analysis, it is still impossible to take a sample fairly from these drillings. They must, therefore, either be melted down in a uniform ingot or button, in which case loss is probable or certain, or they must all be dissolved in acid, and a small portion of this solution taken for analysis, which method entails more work and complicates matters considerably. In order, therefore, to see if a smaller amount of drillings could not be obtained that would at once be uniform and representative, an ingot was selected from each of the five shipments, and drillings taken from the top, bottom and center of each ingot. They were all analyzed separately, the 60 determinations thus obtained being tabulated. It was found that the center determination was a fair average between the top and the bottom in all but two or three cases, and even where this was not true, the difference was not serious. The tin and lead were always slightly higher in the bottom, and the copper and zinc slightly higher in the top, with the center, as stated previously, falling in between, except in two or three instances.

In order to determine the uniformity of the ingots, an analysis was made of a sample

*Metallurgist, the Crane Valve Co., Bridgeport, Conn.

taken from 10 ingots, also a separate analysis was taken from each of three additional ingots. These results were all tabulated and the specifications drawn up with such allowances and variations as easily to include all the ingots of lots worked upon.

Some objection might be raised to the comparatively small number of ingots (10) taken for a sample. It was desired to have specifications elastic enough so that they could be used either in every day work or in more particular cases of arbitration. In order to carry out the idea of having a definite small amount of drillings from each ingot in the final sample as weighed out in the laboratory for analysis, it was necessary to start with a definite number of ingots. This number (in this case, 10), can be considered as a unit, and in instances where it is necessary to sample large lots of ingots, two or three units can be taken if it is thought desirable. In this way, a general average can not only be obtained from twenty to thirty ingots quite as readily as in any other way, but at the same time, by having them in two or three separate units, a much better idea is given as to their uniformity.

In reference to those metals, such as iron, aluminum, etc., which occur in small quantities, it is believed to be much better to treat them individually, as each particular demand may call for, than to bunch them all under one head as "Impurities." Slags and oxides are more properly impurities and under no circumstances should they be present in good metal. Iron is practically always present in small quantities, and in the case of composition ingots, 0.30% is believed to be fair to both buyer and seller.

In regard to aluminum, there is already some discussion as to how much may be allowed without injury. As previously pointed out, there are alloys (besides the regular aluminum bronzes) in which aluminum is an important ingredient, but it does not alloy well with lead and the average founder, whose product has to stand a hydraulic test, had better "cut it out," at least until more is known about it.

There are other elements, such as sulphur and antimony, which are occasionally found in compositions, which will, in all probability, have to be governed by specifications, but for lack of data, have not been included in those herewith presented

Specifications for Composition Ingot

The analysis of each particular lot will be agreed upon at the time of purchase and the sampling and allowable variations will be as follows:

Method of Sampling:—Ten ingots will be selected at random and drillings taken from the center of each one by drilling nearly half way through the ingot with a ⅜ in. or ½ in. drill, withdrawing the drill and saving the drillings from the next 3/16 in. or ¼ in. in depth. The drillings thus obtained from the center of each ingot will be kept in separate envelopes and sent to the laboratory. At the laboratory, 0.1 gram, (weighed a little heavy) will be taken from each envelope and mixed together giving a final sample of a little over 1 gram, from which 1 gram (exact) will be taken for analysis, or better, place 0.1 gram from each envelope, one after the other on the pan of the balance, weighing each 0.1 gram approximately by adding 0.1 gram to the weights already in the opposite pan. When the final 0.1 gram is added, the 1 gram weight is placed in the weight pan and the sample weighed accurately.

In case of dispute, a second lot of 10 ingots will be drilled in the same manner as the first. From each of the 10 drillings thus obtained, a two gram sample will be weighed out and placed in separate envelopes. These 10 envelopes will constitute the seller's sample and will be sent to him without mixing, giving his chemist an opportunity to take equal amounts from each, to make any size sample he wishes for analysis, also to make checks and test separate ingots if necessary. A similar sample can be made up for an umpire if desired. From the drillings which remain, we will take our sample as originally described.

If buyer and seller come within 0.5% of each other, the average will be considered as final. If the difference is greater, the umpire's results will be averaged with those nearest to his and party at fault will pay expense of umpire.

Allowable Variations.

A variation of the 10 ingot sample from the specified analysis will be allowed as follows:

Copper	1% either way
Tin	¼% either way
Lead	¼% either way
Zinc	¾% either way

An extreme variation among the 10 ingots from which the original sample was taken must not exceed:

For Copper 3%
For Tin 2%
For Lead 2%
For Zinc 2%

In all cases, ingots shall be free from aluminum and the iron shall not exceed .30%.

Stripping Nickel from Brass and Copper Goods.

When nickel plated brass or copper goods are to be plated again with nickel, the old nickel deposit must be removed. It is impossible to plate over it again and have the second coating adhere. It will always peel. To remove the nickel from nickel plated goods, a so-called acid "strip" is used. It is made as follows:

Sulphuric Acid ..... 3 gallons
Nitric Acid ..... 2 gallons

The sulphuric acid is poured *into* the nitric acid and the whole allowed to cool after stirring. This stripping dip should not be used too cold, however, as it then works too slowly and in winter it should be slightly warm.

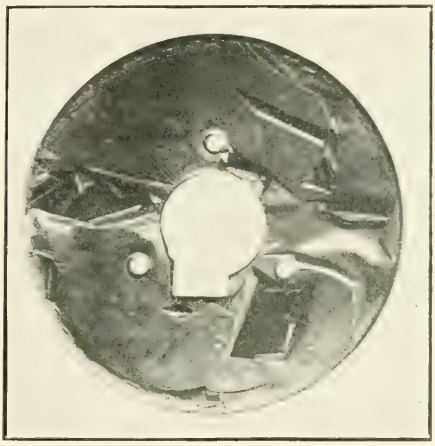
The work to be stripped should be as clean as though it was to be plated as a greasy surface will cause the acid to work unevenly. The work is immersed in the strip and moved around. Before immersion, however, the goods should be *dry*.

A light nickel deposit will usually come off in a minute or two, but heavy deposits require a longer time. If the dip works too slowly on account of the acids being too strong, a little water can be introduced.

By moving the articles around in the strip, the nickel is more rapidly removed. Care should be taken to remove all of the nickel as it is frequently the case that small patches are left that are not readily seen in the strip. When the nickel has all been removed, the surface of the brass or copper is left fairly smooth although dead. Unless too much water has been used in it, the surface will not be pitted and can easily be buffed on a rag wheel to a good finish ready for the re-nickeling.

Difficulty of Depositing Nickel on Nickel.

Experienced platers well know that nickel cannot be deposited upon an old nickel plated article. It is one of the things soon learned by experience. The difficulty found is that the second nickel deposit does not adhere, but readily peels. Frequently this takes place in the buffing or the slightest bending. In the photograph herewith shown, such a nickel deposit is illustrated. The article was first nickel plated and then buffed and allowed to remain for quite a time. A second nickel deposit was then put on with the result that a slight bending caused the second nickel coating to peel off as indicated.



Article in Which Nickel was Deposited Over a Previous Nickel Deposit, and Showing the Peeling.

The cause for this phenomenon is two-fold:

1. The nickel slightly oxidizes on the surface like iron, but not enough to be visible. This oxide is not readily removed. The oxidation, however, is more apt to be the cause of the peeling on nickel plated goods that are quite old, as the nickel then has an opportunity to oxidize.

2. The buffing compositions that remain on the surface. This is the common cause of the peeling of nickel deposited upon nickel that is comparatively fresh and has not been exposed to the air for any length of time. Vienna-lime and similar compositions, which contain paraffine and other mineral greases and waxes, are used to a large extent at the present time for buffing nickel. These work

into the pores of the deposited nickel and also remain on the surface. Ordinary cleaning does not remove the mineral greases or waxes and the result is that the nickel deposited as a second coating does not adhere. When buffing compositions using animal fats that readily saponify are used, the condition is not as bad, but even with such compounds, the nickel is apt to peel. It should be borne in mind that all electrodeposits are made up of a net-work of minute crystals and which, of course, cause the deposit to have a porous nature. When buffed, the buffing compound enters these pores to a greater or less extent and is difficult to clean out.

The customary method, and one which is almost universally used, is first to remove the old nickel deposit before a new one is put upon goods that are to be re-plated. This can be accomplished by a stripping dip, in the case of brass, copper or similar copper alloys, but in the case of iron or steel, polishing is usually followed to remove the old nickel deposit.

An electric cleaner, however, has been used with good results for removing the film of grease and other foreign matter on the surface of buffed nickel work. In some instances this has been employed as a commercial process for depositing a second metal, such as silver or gold, on the buffed nickel, and without peeling. As far as known, it has not been used to any extent for cleaning work to be re-nickeled, but with careful manipulation it possibly could be employed. As a usual rule, however, stripping is more certain and conducive to satisfactory results.

New Silver Deposit Process.

A new silver deposit process has recently been patented by P. Marino of London, England (British Patent, 14,033, June 13, 1911). This process apparently cannot be applied to glass as the inventor states that the article to be treated shall be "absorbent and free from enamel." Earthenware and similar articles can, therefore, be treated.

The article is first coated with a solution of silver fluoride and then subjected to the action of a stream of coal gas. It is finally heated to about 120° F. in the vapor of carbon bisulphide. The silver deposit thus obtained is rendered dense and more adherent by scratch brushing.

Notes on High Pressure Gas.

The best dimensions for crucible furnaces, "for all metals up to German-silver," says E. W. Smith in the *Journal of Gas Lighting*, page 699, 1911, are as follows:

Distance from the center line of the burner from the tangent to the inside of the furnace, 1 inch. Distance of the center line of the burner from the bottom of the furnace, 2½ inches. Height of the crucible stand, 3 inches. Flue area, 4 x 6 inches, tapered to the damper. Thickness of brickwork (minimum), 9 inches. The face of the burner should be in line with the tangent to the furnace, and full way 3 x 3 inches allowed from the burner to the furnace interior.

The following dimensions for crucible furnaces are given:

The Crucible

Capacity	Height	Diam at Top
60 lb.	11¾ in.	7¾ in.
120 lb.	15¼ in.	9¾ in.
140 lb.	16¼ in.	10 in.
160 lb.	17½ in.	10¼ in.
200 lb.	17½ in.	11⅛ in.

Corresponding Size of Furnace

(Inches Height	(Inches) Diameter	(Cu. Ft. per Hour Gas Consumed
27	10	200
33	12¼	400
33	12½	425
33	12¾	450
33	13¾	490

The figures previously given are for round furnaces as these have been found the most satisfactory. For annealing metals, it is stated by the author that low pressure gas is preferable.

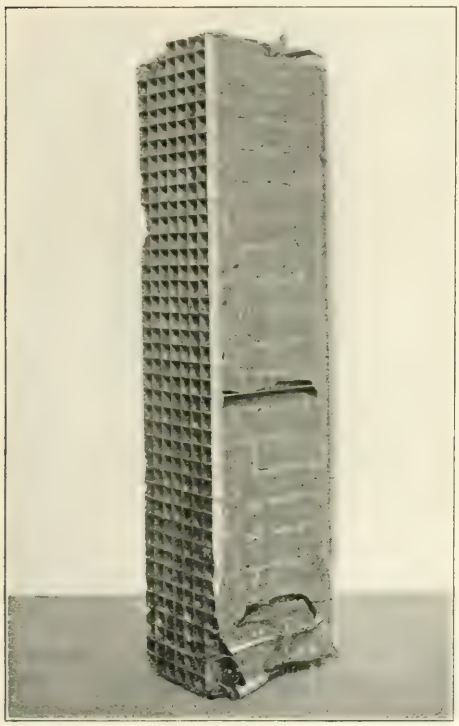
The cost of crucibles, loss of metal and fuel cost, when high pressure gas is used, are given as follows:

for 100 lbs.	For Gas	For Coke
Cost of Pots,	8 cents	10 cents
Cost of Metal Lost,	21 cents	34 cents
Fuel Cost,	15 cents	9 cents
Total Cost	44 cents	53 cents

These figures, of course, are for operating the furnaces in England, and the gas prices there are much lower than in the United States.

Corrosion of Automobile Radiators.

An automatic radiator is a complicated appliance, as far as number of pieces is concerned, although not intricate. It is composed of a large number of small tubes or their equivalent soldered together with soft solder so as to be water tight. The water to be cooled passes on the outside of the tubes, and the air, which cools the water is drawn through their interior by the fan.



Section of Automobile Radiator That was Pitted by the Solution Used in It.

Radiators frequently leak on account of imperfect soldered joints, and to have a leakage in the winter is annoying on account of the necessity of using an anti-freezing mixture in the radiator. When leakage occurs it is usually attributed to faulty soldering or the tearing apart of the joints. Such leakage, however, is not always caused by poor joints, but by the actual corrosion of the metal itself.

Copper was formerly used almost exclusively for the tubes of automobile radiators, but now brass has come into extensive employment. Brass is cheaper and also stiffer and for these reasons it is used. In winter, it is necessary to use a fluid in the radiator which will not freeze at the temperature which may follow in this season. One of the mixtures recommended consists of water, alcohol and glycerine. By adjusting the proportions, the mixture may be used at the lowest temperatures. The use of glycerine, while satisfactory, as far as a freezing mixture is concerned, has been found to attack the brass of the radiator and corrode it to such an extent that it becomes penetrated and leaks. In the portion of the radiator herewith shown, the glycerine was the material which caused the corrosion.

Just what the action is is not known, but it is believed that the corrosion takes place on account of the use of an impure glycerine which may contain acid, or may decompose under the action of the heat and form an organic acid. This action has not yet been investigated, but it is known that glycerine will cause a corrosion of the brass in the radiator.

An anti-freezing mixture composed of water and alcohol is now advocated as it does not attack the radiator and answers perfectly. By adjusting the proportions, a mixture to stand any desired temperature may be obtained. Glycerine, therefore, is not to be recommended.

Welding Copper.

According to Roy C. Davidson of Fort Blackmore, Va., copper may be welded in the following manner. The pieces to be welded are placed in a fire and heated to a black heat, after which they are coated with borax. The two pieces are then removed and hammered. They are again returned to the fire and the process repeated. This is repeated once more after which the joint is covered with ferrous sulphate. The pieces are now placed in the fire again and heated as hot as the copper will stand without melting, and the joint hammered together. It will be found, the inventor states, that a sound and homogeneous joint will then be had.

Notes on the Electrodeposition of Black Nickel.

Black nickel deposits are now so extensively used and platers desire so much information on the subject that it is believed a few remarks, in addition to the articles previously published on the subject in THE BRASS WORLD, may be of value to those who desire to use this interesting process.

Let it be understood at the beginning that to work the solution successfully, the following points must be carefully observed:

1. To use the solution strong. All the double nickel salts that can be dissolved in the solution should be used.

2. Use a weak current. The voltage should not be over 1 if a uniform black is to be obtained. That the current strength is right may readily be determined by the manner in which the deposit first forms on the work. The first flash of nickel on the surface of the work is iridescent and does not spread over the whole surface. Then the whole surface is covered. Next the deposit takes on a bluish shade until finally the real black deposit is formed. If the deposit flashes up immediately to a uniform color, the current is too strong. It should form slowly passing through the iridescent stage and a minute or two should elapse before the black coating makes its appearance.

3. Do not deposit too heavy a coating. The deposit is heavy enough when the color is right. Very heavy deposits are apt to flake as the deposit is more or less brittle. As a weak current is used, however, the formation of a sufficiently heavy deposit may take from 30 to 60 minutes.

4. Use plenty of anodes. Old ones are the best as they give up their nickel more readily than those which are new.

5. The acidity of the solution should be neutralized, when the occasion arrives, by the use of nickel carbonate. A neutral solution gives a better black nickel deposit than one that is slightly acid.

The Solution

The solution that has been found best for the purpose is the following. It has been found expedient to increase the amounts of double nickel salts and zinc sulphate as the deposit seems to be more uniform:

Water	1 gallon
Double Nickel Salts	10 oz.
Ammonium Sulphocyanate	2 oz.
Zinc Sulphate	2 oz.

This solution contains practically all the double nickel salts that will dissolve in water, and if, during cold weather, any should crystallize out, the bath should be warmed. In fact, the solution works better if warmed to about 100° F. When hotter than this the deposit is apt to come gray. It may be said, therefore, that the temperature of the solution should be maintained at from 70 to 100 degrees F. At 60 degrees, and lower, some of the nickel salts will usually crystallize and the solution does not work as well.

If the nickel deposit, instead of coming black, has a gray color, it usually indicates that the current is too strong. When streaks form on the surface of the work, it also indicates that the current is too strong. In an old solution, however, it may happen that it has become acid; and if it is found that, even by reducing the strength of the current, a black deposit cannot be obtained, in all probability the solution contains free acid. Nickel carbonate is the best material for adding to the solution to neutralize this acidity, but in case it is not had, then ammonia can be used. Test paper should be employed for ascertaining the condition of the solution. If, before adding the nickel carbonate or ammonia, blue litmus paper is turned red, then the solution is acid. In the case of the nickel carbonate, it can be added until no more dissolves. A slight excess will not harm the solution. In the case of ammonia, however, great care should be taken to avoid an excess and when the point is reached where neither red nor blue litmus paper is changed, no further addition should be made.

Black nickel deposits often come out of the solution black and satisfactory, but when rinsed and dried have a brownish shade. This may be removed by the use of the perchloride of iron dip. This dip will not attack the black nickel deposit unless the articles are left in it too long. A momentary immersion is all that is required, after which the articles are rinsed and dried. The dip is made up as follows:

Water	1 gallon
Perchloride of Iron	12 oz.
Muriatic Acid	1 oz.

Black nickel that is exposed to the air, will gradually assume a brown color, but this is only superficial and can be wiped off. It is really a tarnish. In order to guard against this, however, it is customary to lacquer all black nickel articles. Not only does it prevent tarnishing, but increases the uniformity and depth of the color. It is always advisable, therefore, to lacquer all black nickel deposits.

Black nickel is now extensively used as a base for the application of the dead black lacquers and japans employed on automobile and similar work upon which a durable black finish is desired. If the lacquer or japan is applied without first giving the brass a black deposit of some kind, any slight peeling or scratching will show, but when the black nickel is used as the primary coating, it will not be visible to an extent that will cause unsightliness.

Melting Bronze in a Cupola.

"I have taken out a heat of bronze metal in a No. 5 Whiting cupola, and will tell you how I did it," says P. D. Malloy in the *Obermayer Bulletin.*

"I charged my cupola the same as I would for heat of gray iron. Put on the blast at 2:30 p. m. and in 25 minutes, tapped the cupola and took off 1,350 lbs. Swinging the crane ladle around to the mold before pouring, holding ladle twenty minutes, then swinging crane ladle back to the cupola, tapped out again from 300 to 400 lbs. It took just one hour to take off the heat, containing from 1,600 to 1,700 lbs. of metal. Found in this heat the shrinkage was very low."

"By regulating the tuyers, there is no trouble in running out the metal at any heat necessary. Carried the blast from 7 to 7¼ ounces in this heat."

"I cannot see why bronze metal cannot be run out of a cupola successfully."

Recent investigations have shown that the electrical conductivity of metallic sodium is thirty per-cent greater than that of potassium. Sodium has about one-third the electrical conductivity of copper.

Mercury is now rarely used in the manufacture of glass mirrors, but they are coated with pure silver by a self-depositing silver solution.

Making Fulminate of Gold for Gold Plating.

Fulminate of gold is extensively used in gold plating. Whether it is superior to the chloride or the cyanide of gold has never been demonstrated, but it is known to give very satisfactory results, and for this reason is widely employed. It cannot be allowed to dry or it will explode, so that it is necessary that every plater who uses it shall make his own.

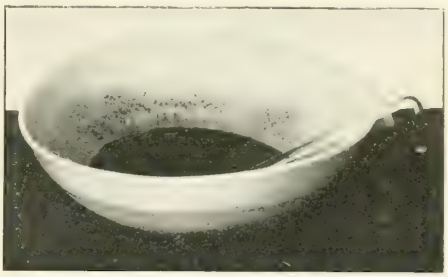


Fig. 1. Porcelain Evaporating Dish with Chloride of Gold in It, and Evaporated Down to Syrup.

Fulminate of gold is made by precipitating a solution of chloride of gold by means of ammonia, filtering out and washing it, and then dissolving it in cyanide for making the gold plating solution.

Dissolve the gold, in the form of small pieces, in an evaporating dish or casserole by means of aqua-regia. Aqua-regia is a mixture of nitric and muriatic acids, and about 3 parts of muriatic acid to 1 of nitric acid are used.

Place the gold in a porcelain dish as shown in Fig. 1 and add the aqua-regia. For 1 oz. of gold, add 9 oz. of strong muriatic acid (chemically pure) and 3 oz. of strong nitric acid (chemically pure). Then warm the dish gently on a sand bath and the gold will dissolve (fine gold must always be used) if it is in thick sheet and the dish is not heated very much. More acid in the right proportions may be added if necessary. When all the gold has dissolved, the solution of chloride of gold obtained is evaporated on the sand bath until the liquid is syrupy. Do not evaporate dry or the gold will be apt to partically change back to the metallic condition again. When carried sufficiently far, the chloride of gold will resemble molasses and has the appear-

ance shown in Fig. 1. The object of this evaporation is to remove the free acid.

The syrupy chloride of gold in the dish is now dissolved in water and the whole filtered from the chloride of silver and other slight amount of foreign matter that may be present. The filtered solution is run into a beaker or flask and enough water is added to it to have a volume of 20 ounces for every

Fig. 2. The Fulminate of Gold When Filtered and Ready for Dissolving in Cyanide.

ounce of gold. Ammonia water is now added and the whole stirred with a glass rod, until no further precipitation takes place. The precipitate is fulminate of gold. This is in the form of a dense, yellow mass which settles readily.

Allow the precipitated chloride of gold to settle and pour off the clear liquid which is of no value. Then add clean water and stir up, allowing to settle and again pour off the clear solution. This should be repeated several times and finally, after this has been done, pour the fulminate on paper filter in a glass funnel, as shown in Fig. 2, and filter it out. The fulminate in the funnel, after the liquid has drained off from it, should be washed several times with pure water.

The fulminate of gold is now obtained in the filter free from foreign matter in the form of chloride of ammonium (sal-ammoniac) formed during the precipitation with the ammonia. *Under no circumstances allow the fulminate to dry as it then becomes explosive.* There is no danger while it is wet. It should at once, when the washing is completed, be dissolved in the cyanide solution. The paper can be put in with the precipitate on it, and after the fulminate has dissolved in the cyanide, it can be taken out and thrown away.

A German Method of Nickel Plating Aluminum.

A process recently brought* out by Ernst and Otto Becker of Iserlohn, Germany indicates that there has been as much difficulty in the electroplating of aluminum in Germany as in the United States. In connection with their process they say:

"The numerous attempts made to provide aluminum with a coating of some other metal, for instance nickel, show that the plating of aluminum is, technically, of great importance. However, the results, so far obtained in this direction have not been very successful, since the metal coating, mostly applied together with an intermediate layer of some other substances, easily scales off the plated aluminum articles when the latter are put to use. The consequence is that plated aluminum articles have so far had little or no practical utility."

The process brought out by the aforesaid inventors is in the solution used for cleaning the aluminum and the nickel plating solution is of the ordinary kind. The method of cleaning is as follows:

The cleaning bath is composed of the following ingredients:

Water	1 gallon
Potassium Cyanide	8 oz.
Ammonia Water	4 oz.

This bath is heated to boiling and the aluminum is immersed in it for 15 seconds and then transferred to a second solution composed of the following:

Water	1 gallon
Cream of Tartar	4 oz.

The cleaning process is twice repeated, the immersion in the cyanide bath being, however,

*Also patented in the United States (1,014,500.)

in the latter instances to the extent of from 3 to 5 seconds.

After the aluminum article has been cleaned of grease in this manner, it is transferred to the regular nickel plating solution and the nickel deposited in the usual manner. It is recommended that boracic acid be used in the nickel plating solution to render the nickel deposit as soft and pliable as possible.

"Canadium"; A New Metal.

According to A. G. French in the *Chemical News*, 1911, 104, page 283, an apparently new metallic element has been found in the trap-dyke of the Nelson District of British Columbia. The name of "Canadium" has been given to this supposedly new element.

The new metal is found associated with platinum and metals of the platinum group in the form of grains and scales and in quantities up to 3 oz. per ton. The metal is white, has a brilliant lustre and is softer than platinum, palladium, ruthenium or osmium. Its melting point is near that of silver. It is not affected by moist air or by heating in the air for a long time. Sulphur and sulphurous gases have no effect upon it, but it is soluble in nitric and hydrochloric acids, and acts electronegatively to silver in dilute acids. It is not precipitated from its solutions by chlorides or iodides.

Dies made of cast-iron are now used quite extensively in the East for stamping metals. They are used in place of steel dies and can be cheaply made. A hard, tough iron is employed and the mold is made of dry sand. Much care is taken with the face of the mold to obtain a sharp impression. These dies are superior to those of bronze for the reason that they are harder.

Solutions for use in plating barrels must be strong and it is customary to use them practically saturated. A nickel solution for barrel use, for example, should obtain all the double nickel salts that the water will take up. The object of these strong solutions is to supply the necessary conductivity as the barrel itself acts as a partial insulator to the electric current.

Some Recent Patents on Crucible Furnaces.

Some recent patents on crucible furnaces issued during the past months indicate that the furnace inventor is still active.

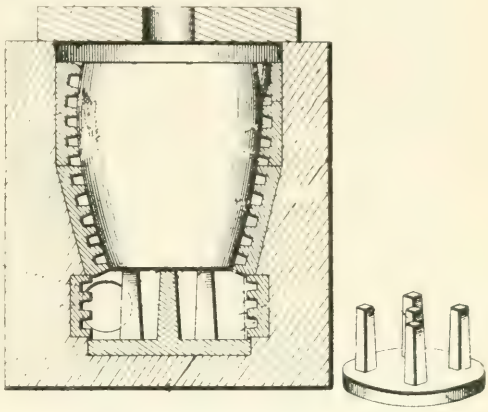


Fig. 1. Furnace Patented by W. W. Case.

A patent granted to Willis W. Case (now deceased) of Denver, Col., is shown in Fig. 1. The crucible is supported on a base with prongs on it so as to allow full heating of the bottom. The sides of the furnace are made with corrugations or slots in order to allow the heat to pass around the crucible to a better advantage. The bottom of the furnace acts as a combustion chamber and the burner is set on a tangent. Oil is used for the fuel.

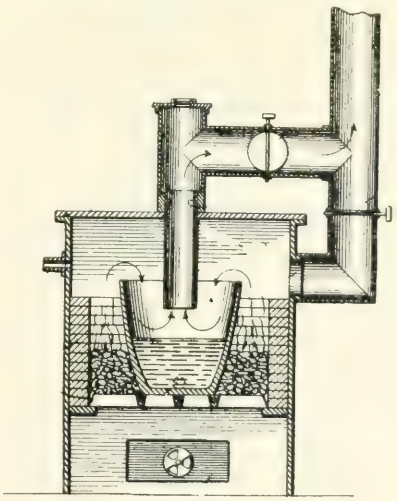


Fig. 2. Furnace of George E. Behrens.

A patent issued in the name of Geeorge E. Behrens of Ivoryton, Conn., is illustrated in Fig. 2. A pipe is placed directly over the crucible as shown and its object is to circulate a non-oxidizing gas over its top. The gases are obtained from the coal or coke fire and by means of dampers shown in the illustration, they are made to pass over the crucible to a partial extent.

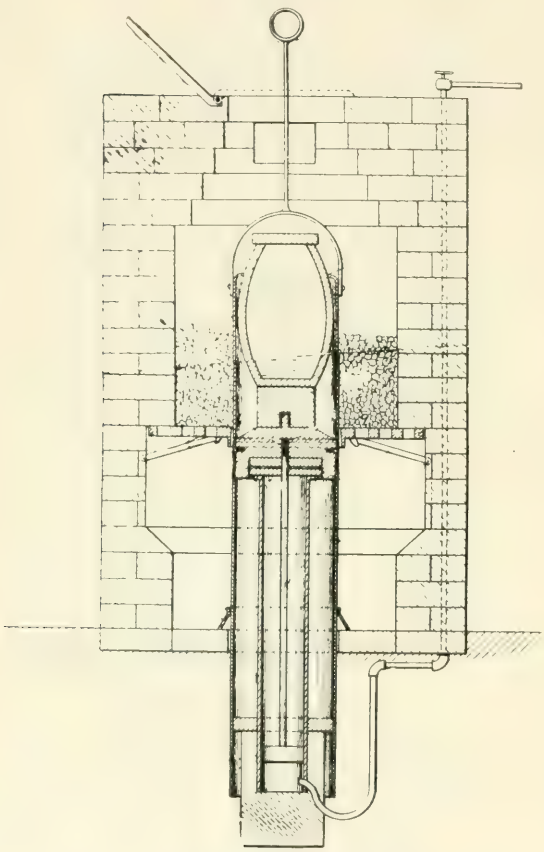
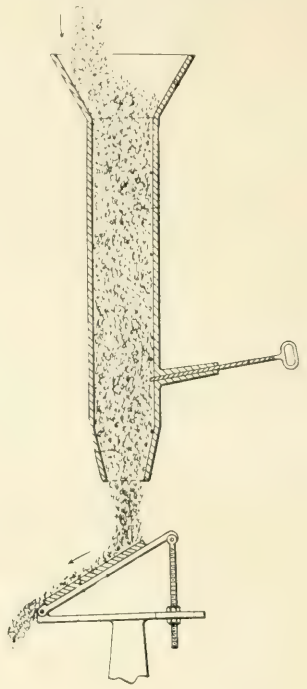


Fig. 3. Apparatus for Raising Crucibles from the Furnace.

In Fig. 3 is shown a patent device for lifting a crucible from a furnace without grasping with tongs. It was granted to Louis Hubert John De Bats of Zelienople, Pa. The crucible rests upon a base operated by an air hoist and which protudes through the bottom of the furnace. A "protector" is made of sheet iron pipe and this is lowered into the furnace around the crucible and the hoist, being operated from the bottom, pushes the crucible up to the top of the furnace.

A New Drying-out Process.

A new drying-out process for small metal goods has recently been patented * by Arthur W. Hutchins of Cranston, R. I. This process differs from others in that nothing but sawdust is used.



New Method of Drying-Out Plated Work by Means of Sawdust.

In drying out work after plating or dipping by means of sawdust in the usual way, the sawdust itself becomes moist and does not dry the goods well. In order to obviate this and bring as large a quantity of sawdust in contact with the surface of the goods as possible, the following method is used:

The articles to be dried are placed in a basket or tray and the sawdust allowed to fall upon them from a hopper as shown in the illustration. If desired, the sawdust may be driven upon the work by a blast, but the gravity feed is usually preferable. It is claimed that the constant stream of dry sawdust rapidly and effectually dries the articles, and at the same time imparts a much brighter finish to them than can be obtained from drying-out in the saw-dust box in the ordinary manner.

* U. S. Patent, 1,012,644, Dec. 26, 1911.

A Core Testing Machine.

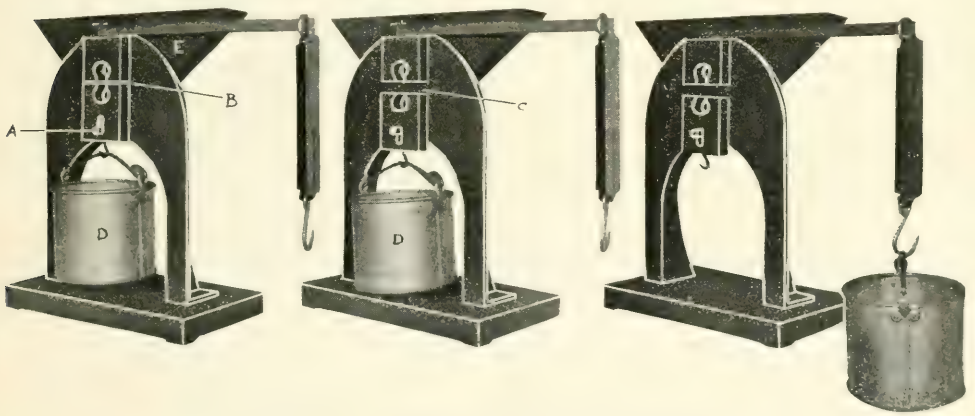
For many years there has been a demand for some practical means of comparing the strength of various core binders. It is also often important to be able to compare the strength of different core mixtures as affected by changes in sand oils and binders.

Some five years ago George H. Wadsworth started a series of experiments on core mixtures. The work was carried on jointly by George H. Wadsworth and H. M. Lane, but was dropped for the time on account of lacking the equipment for making accurate determination. During the past year the work has been taken up once more and a number of manufacturers have collaborated to carry out the work.

During the experimental work a number of different methods of testing cores were tried. Broadly, the choice lay between a tension and a transverse test. In the case of very strong cores such as oil sand mixtures used for radiators, some classes of fitting cores, gas-stove burners, etc. The transverse test on a one-inch square core 15 inches long gave fair results, but it was difficult to turn out these large cores in quantity without rods and to be sure that they would not contain mechanical defects which influenced the strength. Then, too, the transverse test on bars of this length was not delicate enough to give a comparison between mixtures of approximately the same strength.

In testing the tension methods, an ordinary Fairbanks cement testing machine was first employed and this was found excellent for very strong core mixtures, but was not delicate enough for the weaker mixtures common in grey iron, brass and malleable foundries. There is on the market a small machine operating on the spring principle which was tested for this purpose, but as its price was fairly high and its capacity limited to 50 pounds per square inch, it was not found universally satisfactory, and hence the new Wadsworth Core Testing Machine was developed as shown in the accompanying illustrations. The core used is the shape of the ordinary concrete briquette, having an area of one square inch in the center. The core is placed between the jaws when they occupy the position shown at the left, the jaws being closed together as shown at B. The illustration, however, does not show the core in place. The pail D is hung to the lower jaw so that it is supported by the core. The hopper E is filled with shot and by raising the pin A, to the top of the slot in the jaw, a small gate at the bottom of the shot hopper is opened and the shot is allowed to flow into the pail D. As soon as the weight of shot in the pail becomes sufficient the core breaks and the jaws separate as shown at C in the central view.

As the lower jaw descends it carries with it the pin A, thus automatically closing the shot valve. The jaw, however, is so arranged that the pail and jaw remain supported upon the pin A without coming in contact with the base of the machine. The pail is then lifted off and hung on the spring balances as shown



Apparatus for Testing the Strength of Sample Cores.

at the right of the illustration. To get the full weight which it took to break the core the lower jaw must be placed in the pail or a weight equivalent to the jaw must be placed in it. This gives a direct reading of the weight necessary to break the core.

As soon as the reading is taken the pieces of the core are removed from the jaws, the shot poured back in the hopper, another core inserted and the pail hung on once more, as shown at the left. The operation is very rapid, so that it is possible to test at least two cores per minute with ordinary mixtures.

The practical use of the machine is as follows:—If it is desired to test a new lot of sand oil or binder, two batches of cores are made with the same sand, one using the old binder and the other the new, in the same ratio. These cores should be baked on the same plate in alternate rows; they are then taken out, allowed to cool, and broken. The baking temperature will have considerable effect on the strength of the core, but it will affect both samples alike, so that with this method of procedure an exact comparison of the strength of the two binders is possible.

It has been determined that variations in the clay content of the sand and the amount of dirt in the sand or in the shape and size of the sand grains themselves may have a marked effect on the strength of the core, and hence every new lot of sand should be tested as it comes in. To accomplish this take samples of the new and old sand and make with them two lots of cores from a standard binder, as for instance, a sample of core oil kept for the purpose. These two sets of cores should be baked on the same plate and tested as already described.

A check on the regular running of the foundry may be secured by having one or two plates of test cores made from the regular mixtures each day and baked with the regular cores. If the ovens are running either too hot or too cold these test cores will not develop the strength they should. This gives the core room foreman an absolute check on the man who is firing his ovens, and on the man who is making his mixtures. It is possible to control the strength of the cores within very narrow limits, but this is not accomplished in the practice of ordinary core rooms today, and in these irregularities both as to mixtures and temperatures lies the cause of great variations and loss of castings due to irregularities in cores.

If the poor cores are sorted out before they go to the moulding floor the firm is still out of pocket an amount equal to the material contained in the cores, including both sand and binder, the coremaker's labor, the core oven fuel, and the necessary expense of handling. The use of one of these testing machines will afford a quick and inexpensive means of checking the daily core room practice. The machine is manufactured by the Wadsworth Core Machine & Equipment Company, Akron, Ohio, U. S. A.

Absorption of Gases by Copper.

According to recent researches made by Sieverts and Krumbhaar *(Zeit. Phys. Chemie,* LXXIV, 3 page 278) the following results were obtained in regard to the absorption of gases by molten and solid copper:

1. When oxygen is absorbed or dissolved by molten copper, it combines with it in the cuprous state and forms cuprous oxide. Even in an oxygen-free atmosphere, the absorbed oxygen is not given off when the copper becomes solid.

2. Nitrogen, carbon monoxide and carbon dioxide are not absorbed, either by molten copper or the solid metal.

3. Solid copper absorbs hydrogen gas.

4. Molten copper absorbs a considerable quantity of sulphur dioxide gas, but the solid metal does not absorb it.

A New Electrogalvanizing Solution.

A new electrogalvanizing solution has recently been patented by Auguste A. Lemetre of Paris, France and which consists of the following:

Water	1 gallon
Sulphate of Zinc	1 lb.
Sal Ammoniac	4 oz.
Sulphate of Soda	2 oz.
Sulphuric Acid	1 oz.

The solution is used cold and with plenty of zinc anodes. It is claimed that the solution gives an excellent deposit.

An Apparatus for Separating Dross from Lead.

In order to produce clean, free flowing lead, it must be as free as possible from dross. It is customary in the lead refining industry to use steam to liberate the entangled dross from the molten metal and cause it to rise to the surface. When steam is run into the kettle of lead, however, there is apt to be

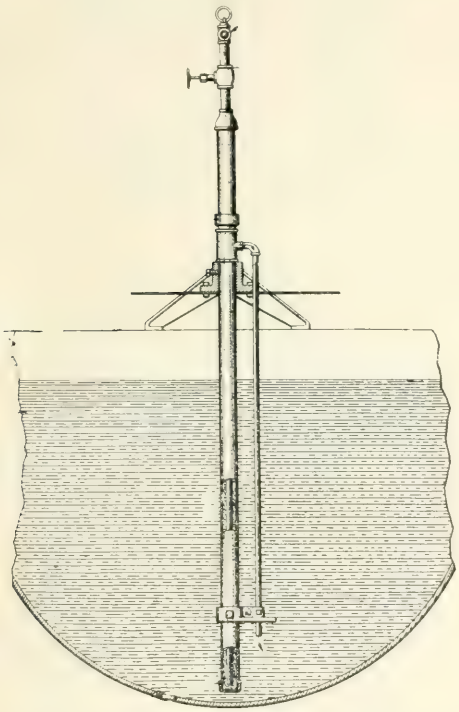


Fig. 1. Lead Kettle with Apparatus in It for Generating Steam and Removing the Dross.

more or less water from condensation which causes the metal to fly out and injure the workmen.

John O. Bardill of Herculaneum, Mo., has invented an apparatus for generating steam in the kettle and in such a manner that the condensed water will do no harm, should any form.

The apparatus consists of a pipe of rather large size through which water is allowed to flow in a very small quantity. This pipe is stopped at the bottom end and reaches down to the bottom of the lead kettle. The bottom portion of this pipe, up to the top of the lead level, is filled with iron turnings so as to present a large surface for the generation of steam. The top of the pipe, where it projects out of the molten lead, is filled with sponges so as to filter the water and prevent too rapid a flow.

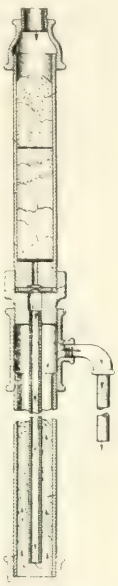


Fig. 2. Steam Generating Apparatus.

A short distance above the level of the lead, a smaller pipe is connected with the large one and this is the "steam pipe." The water that is allowed to flow into the large pipe, passing down the iron turnings into the

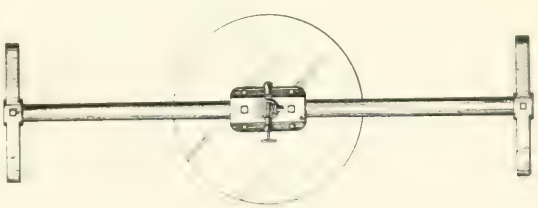


Fig. 3. The Arrangement for Holding the Steam Generator.

heated lead surrounding it, is changed to steam and escapes through the smaller pipe into the molten lead, purifying it without danger of any explosions from condensed water.

Some Modified Plating Racks.

In electroplating work on racks, an objection that has always been found is the fact that the metal deposits upon the rack as well as on the work. This not only wastes metal, but finally renders the rack useless. The current consumption, too, is also increased.

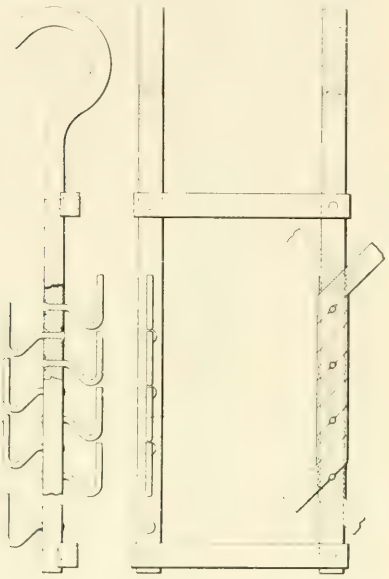


Fig. 1. Method of Making Leffel's Plating Rack.

In order to overcome this objection, C. E. Leffel, superintendent of the plating department of the Spirella Company of Meadville, Pa., manufacturers of corset hardware and trimmings, has invented some new forms of plating racks that prevent the deposition of the metal upon the racks themeselves. These racks have been patented by him and are illustrated in Figs. 1 and 2.

In Fig. 1 is shown a rack made up of separate parts. The main portions are made of strips of brass or other metal, as may be desired, and are split at the ends so that the hooks can be inserted. These hooks are held firmly by screws. When the hooks become coated with metal, they may be removed and new ones inserted without the necessity of discarding the whole rack. To prevent the metal from depositing upon the rack proper, it is covered with a fabric, such as rubber cloth, or similar material. This may also be coated with an insulating paint, like asphaltum if desired.

In Fig. 2 is shown another form of rack. The base is made of wood, and the sides are

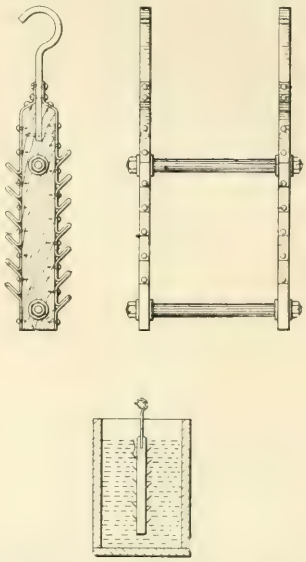


Fig. 2. Modification of Leffel's Plating Rack.

covered with strips of metal through which the hooks pass. When these strips become coated with metal so as to no longer serve

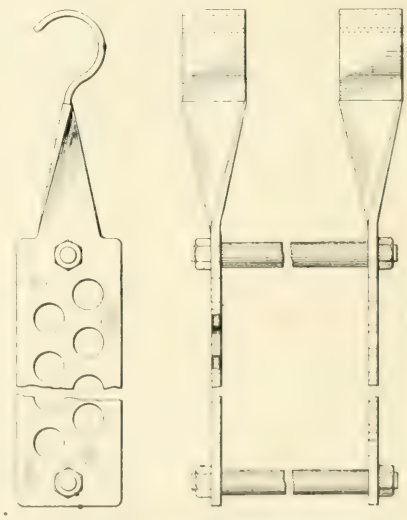


Fig. 2. Kitchen's Plating Rack.

their purpose, they are removed and new ones put in their place.

Additional forms of plating racks have also been patented by John F. Kitchen of the same

company. These racks are shown to expose the minimum surface and also to provide for holding the work at equal distance from the anode. The rack is coated with an insulating paint or composition on all portions except the holes. The cross rods are also coated.

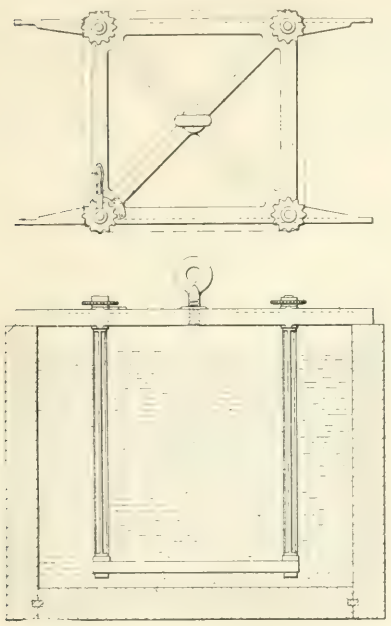


Fig. 4. Kitchen's Method of Preventing Rack Marks on Work Being Plated.

In Fig. 4 is a special form of rack by the same inventor. This is for the purpose of preventing spots on the surface of the plated work from contact. It is made in such a manner that the articles being plated may be shifted during plating without removal from the plating tank. The apparatus is intended for plating long lengths of metal articles such as corset stays.

The process is accomplished by winding the long lengths of the metal in the form of a helix or spring-shape upon the rack. It is indicated by the dotted line in Fig. 4. By means of movable rods at the corners of the rack, the metal strips may be moved when desired. The gear devices on the top of each corner allow this to be done, and are operated by hand.

A Method of "Fire-Coppering" Iron or Steel.

According to William G. Clark of Geelong, Victoria, Australia, who has recently brought out a process for coppering iron or steel, a solid, fire coating of copper may be obtained on these metals in the following manner:

The iron or steel to be coated is cleaned and rendered bright. It is then immersed in the following solution until a suitable coating of copper is obtained:

Water	1 gallon
Copper Sulphate	8 oz.
Sulphuric Acid	16 oz.
Boracic Acid	2 oz.

When removed from this solution, the article is not rinsed but is dried spontaneously and then placed in a furnace and heated to the melting point of copper. When this has been done, the article is immediately removed and without cooling is immersed in a solution of boracic acid in water. When cool, the film of boracic acid on the surface is scaled off and the copper will be found upon the surface in a closely adherent layer.

New Copper-Zinc-Silicon Alloys.

According to a French patent (432,260, July 15, 1911) recently issued, excellent alloys of copper, zinc and silicon can be produced. Two alloys are mentioned and one is stated to be "soft" and the other "hard." The following are the proportions given:

Soft Alloy

Copper	69.6%
Zinc	30.0%
Silicon	0.2%

Hard Alloy

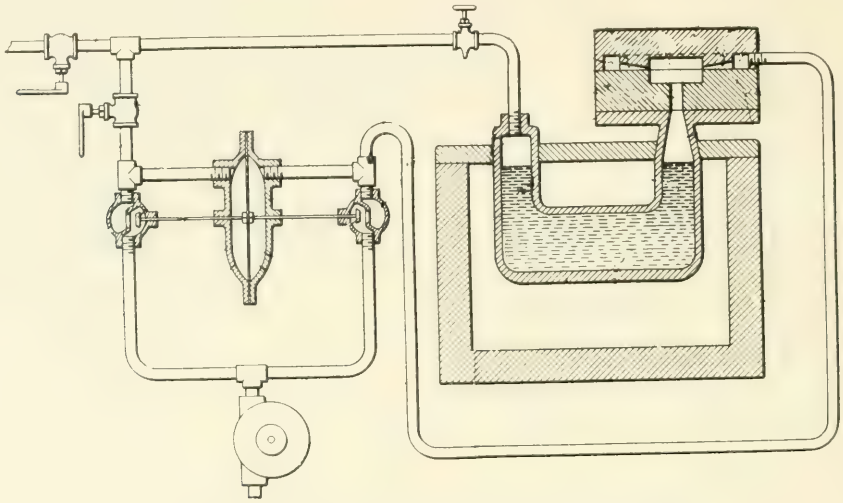
Copper	56.0%
Zinc	43.5%
Silicon	0.5%

The alloys are stated to have great tenacity and stand rolling well. They also resist acids and alkalies much better than brass. It is also stated the micrographic structures are identical with those of ordinary copper and zinc alloys (brasses), containing the same percentage of copper.

A New Die-Casting Machine.

A patent* has recently been granted to Charles M. Grey of East Orange, N. J., for a die-casting machine which is quite novel in its operation. The machine is herewith illustrated. The novelty lies in the following principles:

The metal is melted in a kettle provided with an air tight cover. Two pipes enter this cover. One connects with the mold and the other to an air pressure pump. Another pipe connects the mold with a vacuum apparatus so that the air can be exhausted from it; and at the same time this also exhausts the air from the top of the kettle.



Grey's Pressure Casting Apparatus for Making Die Castings.

To cast, pressure is put upon the metal through the pipe connecting with an air pump which, as will be understood from the illustration, forces the metal into the mold. As the mold itself and the kettle in which the metal is melted, are exhausted from air, the metal really has pressure on one side and a vacuum on the other. This serves to force the metal into the mold with great rapidity and there is no air to cause oxidation or blow-holes in the casting.

The color of a gold deposit depends upon the temperature of the gold plating solution. The hotter it is the redder the deposit.

*U. S. Patent 1,013,548, Jan. 2, 1912.

Notes on Brass Melting Furnaces in England.

Mr. H. L. Reason, the newly-elected President of the Birmingham Branch of the *British Foundrymen's Association,* devoted his presidential address, which he delivered on October 25, to a description of the plant and materials employed in modern brass foundry practice. With regard to the brick-built furnaces commonly used, he advocated their erection when used for crucibles up to 100 lbs. at such a height as would bring their tops about 10 in. above the floor level. That enabled a man to put one leg against the furnace to keep himself steady while he applied all his strength to lifting the crucible out. For crucibles exceeding 100 lb. the furnaces should be level with the floor, for in those cases the crucibles were taken out with hoisting gear. He favoured the use of square crucible furnaces in preference to round, because they required less coke, and were therefore more economical. When building furnaces it was desirable to make them rather small to allow for the burning away and increasing in size. The Carr furnace was similar to the brick-built furnace, but was self-contained and easy to fix.

The coke consumption in a natural-draught, coke-fired, lift-out crucible should be 20 to 25 lb. of hard coke per 100 lb. melted. If gas coke were used from 25 to 50 per cent. more would be required, though in small crucibles

of 60 lb. and under the difference was not so marked. The average temperature for brass melting was 1,600° C.; but some furnaces were worked as low as 1,250° C. For manganese bronze and German silver 1,650° C. was the most suitable temperature. The average loss in melting was about 5 per cent.

After describing various forced-draught tilting furnaces, Mr. Reason said their chief advantages over pit furnaces were a saving of 10 to 15 per cent. in coke, and of about 25 per cent. in the wear and tear of crucibles; while the fact that no time was taken up in lifting crucibles in and out of the furnaces enabled a larger output to be made in a given time. The blast pressure required was about 1½ to 2 in. water gauge. Furnaces of that type were suitable for foundries doing heavy work, mixing alloys, or running down scrap into ingots.

Passing on to a consideration of oil and gas-fired furnaces, Mr. Reason said he visited the Corporation foundry in Windsor Street a few weeks ago and saw a trial run on strip metal casting, the alloy under treatment being copper 72, zinc 28. The furnace was cold when started, having been standing for several days. A run of five melts, each of 160 lb., was made and with gas at 1*s.* 6*d.* per 1,000 the cost worked out at 7.54*d.* for the day's run. After the first melt the cost was reduced to 6.4*d.* per cwt. The time occupied in melting 160 lb. was seventy minutes. The loss in melting was 1.4 lbs. per cwt. as compared with an average of 2 lbs. per cwt. in the coke furnace.

Although tin melts at about 230° C. it has a very high boiling point and distils in a vacuum only with great difficulty. For this reason, tin does not volatilize from the bronzes and brasses containing it, when they are melted. The loss of tin in such cases is by oxidation only.

There are but few sheet metals and alloys which do not scale at a red heat. Pure nickel and nickel alloys high in nickel show very little tendency to scale. Among the copper alloys, an 8% aluminum-bronze possesses the non-scaling property and shows practically no scale at a red heat, even after some time.

How Lampblack is Made.

of black pigments, paints, etc. It is also used in the so-called "black rouges" now extensively employed in "coloring" silver plated ware. In the *Mining and Engineering World,* Oct. 28, 1911, B. B. Butler describes its manufacture in a West Virginia plant. He says:

"At Cabot's lampblack plant in Grantsville, W. Va., the open ring method of manufacture is used, though the waste is greater than in any other. The "rings" in which the lampblack is produced are 60 feet in circumference, and near the top is a flat, smooth, iron plate covering the ring. The black is made by impinging a burning, natural gas jet upon the surface of the plate, which is kept constantly revolving.

Against the plate is arranged an automatic scraper which removes the lampblack produced. By means of screw conveyors the product is conveyed from the scraper to a large bin, where it is ground, sifted, bolted and all foreign matter eliminated. The better part is elevated to a packer bin, while the waste is carried off.

From the packing bin it is run into bags, containing 12½ lbs. each and into barrels containing 100 lbs. The capacity of the plant is nearly 8,000 lbs. daily. Each ring contains 1265 burners. In all, 142945 tips are employed, consuming 9,143,560 cubic feet of natural gas daily. At least one-fourth of the gas is burned, and probably one-third is wasted in the form of lampblack carried through the vents in the "rings" by the heat. A dense cloud of smoke arises from the plant and hovers over it.

Iron that has been electrodeposited is usually quite hard and "springy," and possesses a steel-like character. In fact, it is frequently called " electrodeposited steel." Steel plated (so-called) electrotypes are now a commercial product. The hardness of the iron thus electrodeposited, is caused by the presence of hydrogen gas in it. The hydrogen is occluded (absorbed) while the electrodeposition is going on and imparts a hard quality to the iron. That this is actually so is demonstrated by the fact that, when such iron is heated to redness, the hydrogen gas is expelled and it becomes soft and tough like ordinary sheet iron.

Questions and Answers.

QUESTION No. 1099. We are making another silver solution and would like to have a formula for a good bath that will give a deposit to stand oxidizing.

Answer. Your silver solution to give the best results should contain about the following:

Water	1 gallon
Silver	3 oz.
Free Cyanide	3 oz.

This can be accomplished in the following manner: Take 3 oz. of fine silver and dissolve ("cut-down") with dilute nitric acid (1 part of strong acid and 1 part of water). Then add enough water to bring up to a gallon. Now add a solution of common salt to it until all the silver is thrown down. Stir and pour off clear liquid when the silver chloride formed has settled. Add clean water and stir and allow to settle again. Pour off clear liquid again. Repeat this operation several times and then pour whole on to a filter and wash several times with hot water. When this is done the silver chloride is ready for use. Do not allow it to dry as it then dissolves with more difficulty. Now make up a solution containing 1 gallon of water with 6 oz. of cyanide dissolved in it. Then add the silver chloride and stir until dissolved. This will give you a solution containing about 3 oz. of free cyanide and 3 oz. of silver to the gallon.

QUESTION No. 1100. Are you acquainted with a platinum alloy that is used for valve discs or seats, or that offers great resistance to steam cutting?- If so can you give us any information as to its formula and method of manufacture?

Answer. We have never heard of metallic platinum or its alloys being used for valve seats, nor do we believe that any valve manufacturer could afford to use any platinum material on account of its high cost. Platinum is now worth double the price of gold. There are various nickel alloys on the market and one used for the seats of pop safety valves consists of equal parts of copper and nickel. Monel-metal is also used for valve seats to some extent and is good as it is quite non-corrosive. This, of course, is a natural alloy and consists of nickel, copper and a small quantity of iron. Some manufacturers may call it "Platinum Alloy."

QUESTION No. 1101. I am using a carbonate of copper solution of 100 gallons and would like a suggestion for increasing the conductivity and density. I find the bath is in its best working order when it stands about 15° Beaume. I use rolled copper anodes. Recently, through mistake, I added sodium bi sulphite instead of cyanide and the result is that the conductivity has been impaired and I cannot obtain a bright deposit. Any information on the subject will be appreciated.

Answer. The remedy is simple. You will only have to add more cyanide to neutralize the excess of bi-sulphite introduced. You probably find that your anodes coat over and, therefore, very little current passes. Add a strong solution of cyanide in water, little by little and try. When you find that the anodes remain clean, you have sufficient. We cannot advise you how much cyanide to add, for the reason you did not inform us how much sodium bi-sulphite you added.

QUESTION No. 1103. What is the best etching solution for etching steel? We understand nitric acid is used, but if there is anything better, desire to use it.

Answer. Nitric acid, diluted with water, is the best etching solution for steel, and is almost exclusively employed. Its strength will depend upon the kind of resist you have. If you are using the rubber stamp method of etching, then 4 parts of water and 1 part of nitric acid should be used. If a strong resist, such as asphaltum is had, then you can use a stronger acid—2 parts of water and 1 part of acid. This will work more rapidly than the weaker solution, but the results are no better.

QUESTION No. 1104. We have an inquiry from a concern which requires molds for making glass tumblers with the request that the molds be made out of some bronze mixture. What is the best mixture for making glass molds?

Answer. The commonly used molds for making glass articles are composed of cast-iron as this seems to be cheap and satisfactory. It also stands the heat. We do not know of any bronze that would be satisfactory unless aluminum-bronze could be employed. This bronze is not brittle when hot, as the tin bronzes are, but we fear it would not stand the heat of the glass. If you desire to try it, use 90% copper and 10% aluminum. It is the only bronze that we could suggest for the purpose that would be at all satisfactory.

QUESTION No. 1105. We have sent you some brass clock wheels which have been bright dipped. These show stains on the surface and we would like to know the cause of them?

Answer. An inspection of the samples sent indicates that your difficulty is caused by the wheels becoming attached to one another in the dipping, and when the rinsing takes place, the water does not rinse the acid out. Flat, thin metal discs of this kind are always difficult to dip on this account. It may be necessary for you to string the wheels, putting glass beads or some other material between them so that there will be a space on each side, allowing the water to penetrate and remove the acid completely.

QUESTION No. 1106. Has any concern making die castings yet succeeded in making

brass castings in the die-molds as they do soft metals?

Answer. Brass has been cast in die-molds in the shape of die-castings, but the process has not been successful on account of the fact that the brass cracks in shrinking. There would appear to be an attractive field for the process, however, as the castings, with the exception of the cracks, are quite good.

QUESTION No. 1107. We are experiencing considerable difficulty in re-nickeling steel tubing and would like a little information on the subject. It is absolutely necessary to remove the old nickel before re-plating in order to prevent the second nickel deposit from peeling. How can the old nickel be removed without being obliged to re-polish the steel? We would like a good dip for this purpose.

Answer. There is no method for removing the old nickel that is very satisfactory. If you have a plain surface, like tubing, you will find the cheapest and most satisfactory method, as well as the most rapid, to re-polish the tubing, cutting down the surface to remove the old nickel. This can be done with one operation, unless you wish an exceptionally fine surface. There is a solution which you can also use, if you desire, to remove the old nickel, but it is quite slow, and is not as satisfactory as polishing. The solution is made as follows:

Water	1 gallon
Potassium Cyanide	12 oz.
Yellow Prussiate of Potassium	2 oz.

The nickel plated work is made the anode, and a plate of sheet iron the cathode. The solution is used warm at a temperature of about 120 F. and the nickel "backed off." A low voltage current can be used.

QUESTION No. 1108. What is the mixture used for making the yellow brass castings employed in builders' hardware? By this we mean the regular mixture employed for cheap work. All that is required is a good castings mixture and to have the color a good yellow.

Answer. The commonly used mixture for yellow brass castings for builders' hardware is as follows:

Copper	2 lbs.
Zinc	1 lb.

This answers for all ordinary castings, but in the case of very thin castings which must be stiff, it may be found too soft. If this is the case, then from 1 to 2 lbs. of tin to every 100 lbs. of the mixture can be added and it will stiffen it greatly.

QUESTION No. 1109. We are contemplating depositing a copper water jacket upon our cast-iron motor cylinders used in aeroplanes, because of a change in design. We previously held an aluminum casting jacket in place with shrink rings, but that is now impossible. The cylinder could probably be coated with wax and built up with some sort of filler to allow for the water circulating span between the jacket and cylinder. The German manufacturers of our machines have been doing this successfully, and we believe it possible to do it in our own country. What information can you give us on the subject?

Answer. We think the electrodeposition of the copper can be done, but you will find it one that requires the utmost skill in the operation. The copper will have to be deposited from an acid copper solution, and the iron will have to be coated with paint or varnish in order to protect it as the acid copper solution attacks it. Probably an electrotyper would be more accustomed to the work than an ordinary plater as the job is somewhat out of the ordinary line.

QUESTION No. 1110. Is there any use for an alloy known as "ferro-zinc?" We understand that it is employed abroad in the brass foundry trade.

Answer. Ferro-zinc is an alloy of zinc and iron and "zinc-dross" is practically the same material. When the ferro-zinc is made, however, the maximum amount of iron is alloyed with it and some 8% is obtained. Zinc-dross contains from 3% to 4% of iron. Ferro-zinc is made by heating melted zinc in contact with clean, thin sheet-iron for some time. The zinc dissolves the iron and forms the alloy.

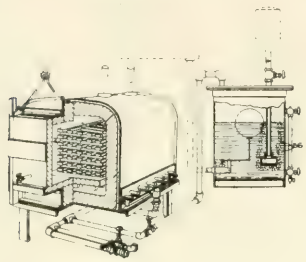
Ferro-zinc is employed for introducing iron into the various brasses and bronzes, and can be used for adding the iron to manganese-bronze. It is a good material for the purpose, and the only objection to it has been its variable composition, but this could readily be remedied if there was a sufficient demand for it. As far as known, it is not produced in this country, and none is imported.

QUESTION No. 1111. We have much trouble in electrogalvanizing a piece of Norway-iron, ⅜ in. in diameter and of various lengths. This core is tapped out with ¼ in. tap to a depth of ⅝ in. We call these "cores" and they are used for electrical appliances. After they have been electrogalvanized, the threads rust while the rest of the core remains clean and free from it. We do not seem to be able to keep these threads from rusting and they are frequently so bad that, after they have been in stock for some time, we have to retap them. What is our trouble?

Answer. Your difficulty is that the zinc does not "throw" into the hole that has been threaded. Unfortunately, electrogalvanizing solutions do not "throw" their zinc as readily as other plating solutions do their metal, and we doubt very much whether it will be possible, even with any kind of metal to deposit it upon the sides of the hole as it is so small and deep. It may be possible that your rusting is made more rapid and pronounced by the fact that the electrogalvanizing solution, after plating the cores, is not completely removed from the holes, and this, being acid, rapidly rusts the iron. We suggest a prolonged soaking in hot, clean water, drying and then oiling the threads or placing a little thin lacquer in the hole.

Patent Abstracts.

1,013,190, and 1,013,191, Jan. 2, 1912. CASE HARDENING APPARATUS. Adolph W. Machlet of Elizabeth, N. J. A method of case hardening iron or steel by means of gases. The articles to be case hardened are placed in a muffle furnace and which is made in such



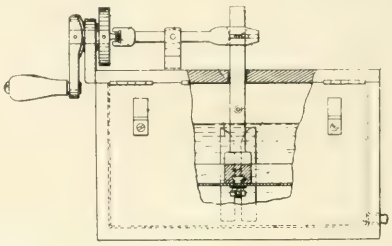
a manner that there is no ingress of air. The articles are also allowed to cool in the gas. The gas is made by passing ammonia gas through naphtha so that the naphtha gas is diluted by the ammonia. Free carbon is, therefore, not deposited upon the articles.

1,013,359, Jan. 2, 1912. ELECTRIC FURNACE. Moses Appel of Baltimore, Md. An electric furnace of the resistance type for the refining of all kinds of metals with a high melting point. The furnace is made to tilt. The bath of molten metal is split up into a series of smaller baths as shown through which the current passes by the use of a number of electrodes.

1,013,620, Jan. 2, 1912. METHOD OF WELDING COPPER OR NICKEL AND COPPER ALLOY. Wilhelm Schreiber of Vienna, Austria. Assignor to the firm of Berndorfer Metalwaaren-Fabrik Arthur Krupp of Berndorf, Austria-Hungary. The metal is welded by heating to a welding temperature with a blowpipe in which oxygen and hydrogen gases are used, but in which the hydrogen is in excess so that the metal is not oxidized, but the oxide which may be formed is reduced.

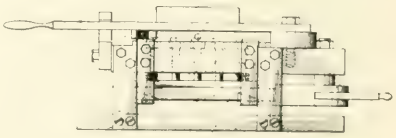
1,013,016, Dec. 26, 1911. MACHINE FOR TAPERING WIRE. James A. Horton of Providence, R. I. Assignor to the British Steel & Wire Co. of Manchester, England. A wire tapering machine which has a hand device for increasing or diminishing the amount of taper the wire receives.

1,013,892, Jan. 9, 1912. ETCHING MACHINE. Robert R. Page of New York City and Frank J. Black of Philadelphia, Pa. A machine for holding a flat plate to be etched so that it may be moved up and down to hasten the etching process. The plate is held



face down in the etching solution so that the metal is etched in the most rapid manner. The machine also provides for the removal of the plate by swinging in an upright position and so it can be examined or washed as may be desired.

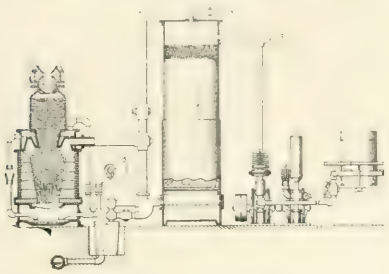
1,012,829, Dec. 29, 1911. CASTING MACHINE. Frank Engel of Buffalo, N. Y. Assignor to the National Battery Co. of that city. A mold for use in casting storage battery parts of lead or lead alloys. The mold is so constructed that while the metal is cast



and the casting is removed from the mold, the gate or sprue is removed automatically and no further work is required on it. Means are also used for ejecting the casting from the mold.

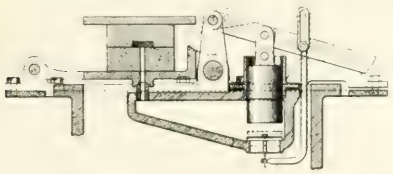
1,013,057, Jan. 2, 1912. METHOD OF MAKING ABRASIVE ARTICLES. Francis W. Higgins of Niagara Falls, N. Y. Assignor to the Carborundum Company of the same place. A method of preventing the deterioration of an abrasive wheel or other body while it is being fired in the kiln. The carborundum is mixed with a fluoride and then shaped into the article, after which it is coated with a glazing material formed of kaolin and feldspar. This glaze, which forms in the furnace, protects the body of the article from being injured by the gases in the furnace.

1,013,593, Jan. 2, 1912. APPARATUS FOR GENERATING HIGH TEMPERATURES. William C. Finck of Elizabeth, N. J. Assignor to George H. Benjamin of New York City. An apparatus for producing high temperatures for welding and brazing. Fuel gas is used and is transmitted to the burner under



pressure. Air under pressure is also admitted. It is claimed that a gas high in carbon is essential and by the apparatus a temperature as high as 3,000° F. may be obtained within a few seconds. It is mentioned that the flame, instead of being yellow or blue, has a green color and in this differs from anything yet used for a blowpipe flame.

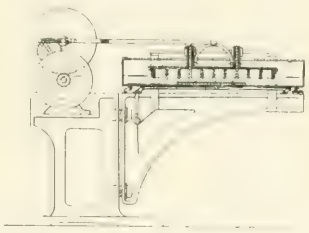
1,013,665, Jan. 2, 1912. DIE CASTING APPARATUS. William A. Leddell of Red Bank, N. J. Assignor to Henry F. Merriam of Summit, N. J. A die casting machine constructed so that the various parts are readily accessible and removable, and also entirely



automatic. An improvement also consists in the means used for the prevention of the fouling of the outlet port of the casting port. The metal is also locked off from this port when the pressure rises to the desired degree.

1,012,814, Dec. 26, 1911. AUTOMATIC BUFFING MACHINE. Charles Albert Clark of Toledo, Ohio. An automatic buffing machine for buffing metal goods. A pair of buffing wheels are used and by means of an electrically controlled head, the goods are fed to the wheels. An automatic chute is used for carrying the articles to be buffed to the wheels.

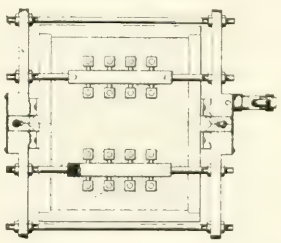
1,013,717, Jan. 2, 1912. ETCHING MACHINE. Eugen Albert of Munich, Germany. A device for use in etching flat plates. The etching solution is forced against the



plate, held in the bath by suitable mechanism, by a paddle wheel. The plate is held face downward and suitable means are provided for the removal of the plate for inspection.

1,014,761, Jan. 16, 1912. MOLDER'S FLASK AND BAND. Joseph F. Lamb of New Britain, Conn. A flask having the sides connected with a corner piece and with flanges at the edge. The material of which the flask is made is of sheet steel and the construction is such as to obtain the greatest strength and still have it as light as possible.

1,013,303, Jan. 2, 1912. MOLDING APPARATUS. Wm. G. Moore of Indianapolis, Ind. Assignor to the National Malleable Castings Co. of Cleveland, Ohio. The invention relates to the supporting and guiding



of gated patterns without the use of a match plate resting in a rabbet in either the cope or drag. An improved gate support is provided and which is also designed so that a mechanical vibrator for patterns may be attached.

1,015,249, Jan. 16, 1912. POLISHING MACHINE. Henry Robinson of South Orange, N. J. A machine for scouring and polishing table knives and other cutlery. The machine is intended for household and similar uses and not for manufacturing.

Trade Items.

The Hammond Brass Works has been incorporated in Hammond, Ind., with a capital stock of $35,000 to manufacture valves.

The Wolverine Brass Works, Grand Rapids, Mich., manufacturers of plumbers' brass goods, will erect an addition to its works that will cover 50,000 square feet. A new and modern power plant will also be installed.

The Chattanooga Brass Mfg. Co., recently organized, has bought the plant and business of the Eagle Brass Works in that city. This plant is located at 406 Boyce St. in that place. H. Boyce is the manager of the new company.

The Columbia Brass Works, Los Angeles, Cal., are erecting a two story brass foundry 50 x 117 feet. Brass, bronze and aluminum castings are made for the jobbing trade. They are now making a particular specialty of bronze automobile bushings.

The Sterling Brass Company, recently incorporated in Cleveland, Ohio to manufacture a line of plumbers' brass goods, has commenced the erection of a new plant on 47th. St. and St. Clair Ave. It will be of brick and steel and two stories high. It is expected that the new plant will be ready for operation in the spring.

William J. Coane, who for the past twenty-five years has been manager of the Philadelphia office of the Joseph Dixon Crucible Co. of Jersey City, N. J., has severed his connection with that company and is now connected with the Ajax Metal Company of Philadelphia, Pa., in the capacity of third vice-president and sales-manager. This is a new office recently created by the company and no other changes have taken place.

Emanuel Blassett Jr., of Bridgeport, Conn., foreman plater for the R. P. K. Pressed Metal Co., and J. M. Dunn, foreman of the plating department of the Holmes & Edwards Silver Co. of Bridgeport, are endeavoring to form a branch of the National Electroplaters' Association in this city and report very encouraging success. The large number of platers in this section should be sufficient to indicate the feasibility of the plan.

The Williamsville Mfg. Co., of Danielson, Conn., have facilities for manufacturing buffs that will appeal to all buff users. They are one of the largest manufacturers of cotton cloth in the United States and, therefore, not only make their own buffs, but their own cotton cloth, from which the buffs are made, as well. This fact gives them facilities for making the highest quality of buffs at the lowest possible price. They have been manufacturing cotton buffs for many years and already number among their customers, many of the largest consumers in the United States. Their name has always been one signifying a standard quality and they solicit inquiries from all buff consumers and will gladly quote on large or small lots.

The Climax Mesh Bag Co., manufacturer of silver mesh bags, have moved to 401 Mulberry St., Newark, N. J. A new patented bag frame is being developed for the market.

A new brass and aluminum foundry is being designed for Dodge Bros. in Detroit, Mich., by the J. D. Smith Foundry Supply Co. of Cleveland, Ohio. It is reported that this plant is to be one of the largest in that city and also in the United States.

Davenport & Keeler of New Britain, Conn., industrial chemists, desire to announce to the trade that they are making a special price this month upon the analysis of lubricating oils. They will be pleased to do such analytical work for fifty cents per element and solicit inquiries on the subject.

The Eagle Smelting & Refining Co. of New York City, scrap metal refiners and makers of solder, babbitt and other white metals, have leased 20,000 sq. feet of floor space in the Bush Terminal in Brooklyn, N. Y., from which all shipments will be made and consignments received. This will give them promptness in shipping that could not be obtained elsewhere.

J. N. Battenfield, for several years vice-president and general manager of the Berkshire Mfg. Co. of Cleveland, Ohio, manufacturers of molding machines, has severed his connection with this company and will devote his time to the development of a new type of molding machine for molding both light and heavy castings.

The firm of Bentley & Green has been organized in Bridgeport, Conn., for the manufacture of soft metal novelties. Quarters have been obtained in the McNamara Building on Union St., where facilities for manufacturing are had and a plant is being equipped. Electroplating will be carried on. W. L. Bentley, the senior member of the firm, was formerly superintendent of the Warner Silver Company of Bridgeport, Conn., and has been identified with the soft metal novelty business for a long time.

The Bennett-O'Connell Co. of Chicago, Ill., manufacturers of electroplaters' and polishers' supplies and equipment, announce that their business for the year 1911 increased twenty-five percen t over any previous year which indicates that their new factory has been instrumental in taking care of orders with the promptness and care that holds trade. Their facilities for manufacturing polishing and buffing compositions are such that they are able to make low prices that will compete with any on the market. All materials for this class of products are purchased in carload lots and are delivered to their door free so that the cost of manufacture is as low as it is possible to make it. They also report that their sales of their new type of plating dynamo have increased over one hundred per cent during the past year.

The Adjustable and Safety Hat Pin Co., 12 Beverly St., Providence, R. I., manufacturers of jewelry novelties, have moved to 31 Mathewson St.

The Lancaster Foundry Co. of Lancaster, Pa., are contemplating the increasing of their plant by the addition of new electroplating equipment.

The Kalamazoo Plating Co. of Kalamazoo, Mich., has succeeded the Shutts-Dewey-Sterling Co. of that place, manufacturers of art metal goods, the metallizing of non-metallic articles and job platers.

Thomas Scheffer of Meriden, Conn., who for the past eight years, has had charge of the plating department of R. Wallace & Sons of Wallingford, Conn., manufacturers of sterling-silver and plated flat ware and hollow-ware, has resigned his position with that company.

G. E. Michael & Co., Huntington, W. Va., who are operating a small electroplating plant at their works, are contemplating the installation of equipment for making electrotypes and would like information in regard to machinery and appliances necessary.

Nelson C. Hyde, formerly automobile editor of the *Syracuse Herald* has become general manager of the Enterprise Metal Co. of Syracuse, N. Y. This company manufacture vanadium-babbitt metal, anti-friction metals and bearing alloys. They are also dealers in pig copper, tin and lead and spelter, antimony and aluminum.

The Hartman Ingot Metal Co., 2511-2515 West 21st. St., Chicago, Ill., manufacturers of ingot copper and ingot brass, has found that the demand for their ingot metals for 1912 has been so extensive that they have found it necessary to install six additional furnaces at their plant for melting. These furnaces are now being built.

The Ferro Machine & Foundry Co. of Cleveland, Ohio, manufacturers of gasoline engines, are now issuing a very elaborate catalogue describing the engines which they manufacture. This catalogue contains 48 pages and in addition to describing the products of the company, it contains a large amount of useful and instructive information on gasoline engines, their care and theory of construction. The catalogue is very elaborately compiled and handsomely illustrated.

A new paper called the *Chemical World* has made its appearance in England and the first number was published on January 1st. The publication is devoted to applied chemistry and the first issue contains much information of value. It comprises 36 pages and the printing and illustrations indicate that the publication is to be conducted in a much better manner than is customary with trade publications. The editor is W. P. Dreaper, F. I. C. and J. & A. Churchill, 7 Great Marlborough St., London, W. England, are the publishers. It is issued monthly and the price is 8 shillings ($2.00) which includes postage to foreign countries

The Southern Stove Works of Evansville, Ind., stove manufacturers, have purchased a tract of land in Carmi, Ind., upon which a new factory will be erected.

The Superior Register Company has been incorporated in Canisteo, N. Y., with a capital stock of $500,000 to manufacture cash registers. The incorporators are J. P. Langs, M. Cohen, Jr., and F. Chormann.

The Worcester Ornamental Iron Co., 140 St. Worcester, Mass., manufacturers of ornamental iron, bronze and brass work, is to lease the buildings formerly occupied by the Harris Car Co., on Grafton St. The growth of the business has made larger quarters necessary.

The Lumen Bearing Co. of Buffalo, N. Y., have secured the services of V. Skillman, formerly with the Aluminum Castings Co. of Detroit, Mich., and previously with Dr. Bancroft of Cornell University. Mr. Skillman will have charge of the chemical laboratory of the Lumen Bearing Company.

Charles O. Lambert has severed his connection with the Lambert & Hammond Company of Wallingford, Conn., manufacturers of soft metal novelties, and has accepted the position as superintendent of the factory of the Warner Silver Co., Kossuth St., Bridgeport, Conn., manufacturers of the same line of goods.

Attention is called to the "Imperial Polishing Tank" made by Smith & Richardson of Attleboro, Mass. These tanks are used for the polishing or cleaning of all kinds of small metal goods, jewelry, etc., that will permit tumbling. These tanks are fitted with bronze bearings and will outwear any tank without them. Write to this concern and they will be pleased to tell more about it.

The American Metal Market & Daily Iron and Steel Report have just issued their "Metal Statistics" for 1912. Metal consumers who are interested in the statistics of the various metals should obtain a copy as in it matter is compiled not found elsewhere. All the statistics of copper, zinc, lead, tin, aluminum and silver are given with prices for the past 10 years. This book contains 222 pages and can be obtained from the American Metal Market Co., 81 Fulton St., New York City to whom correspondence should be addressed.

The Zucker & Levett & Loeb Co., which went into bankruptcy some time ago, has been reorganized and started in business again at 132 Nassau St., New York City. The office of the old company was at 516 West 25th St. The new company has obtained all the formulas, patents, trade-marks, etc., and are to manufacture a full line of compositions and waxes. The manufacturing is mostly done in Brooklyn and New York, but a small quantity is made in Cleveland and Chicago. The business for the present is being conducted on very conservative lines. The sale and manufacture of a full and complete line of plating and polishing supplies will be carried on.

The American Brass Company of Waterbury, Conn., has purchased property on Meadow St., in that city and will, it is stated, build a new office building on it.

Phillips & Carr, 250 Eddy St., Providence, R. I., have succeeded A. O. Kellogg who manufactured "Hough's" Centrifugal Jewelry Drying Machine.

The Joseph Dixon Crucible Co. of Jersey City, N. J., have just issued a new circular on crucibles which contains much information. It contains tables of standard sizes of crucibles, and a description of the special crucibles now made by this company. It will be sent free.

The Frederick-Ruggles Mfg. Co., of Louisville, Ky., manufacturer of measuring devices recently enlarged its plant by the addition of a nickel plating department. The brass foundry of the company has also been enlarged by the addition of two furnaces and has been moved to 107 North Wenzel St.

Wesley L. Clark has been promoted to the office of general manager of the Derby Silver Co. of Shelton, Conn. This position was left vacant by the death of Watson J. Miller and Mr. Clark has acted in the capacity of assistant manager for some time. This company is known as Factory B. of the International Silver Co. of Meriden, Conn.

Wm. C. Buckelew of Bridgeport, Conn. is organizing a new brass foundry company and will shortly build a large and extensive plant in this city. Mr. Buckelew was formerly treasurer of the Fairfield Aluminum Foundry Corporation which sold out to the Aluminum Castings Co. some time ago. An option on a large tract of land near the plant of the Crane Valve Co. has been obtained. The present address of Mr. Buckelew is 304 Golden Hill St. and organization is now being completed.

At the annual meeting of the Keystone Bronze Co. of Pittsburgh, Pa., the following officers were elected: President, Montgomery Murray; vice-presidents, W. H. Schoen and George Best; and secretary and treasurer John S. Craig. This company operates the Keystone Bronze plant at 38th. and 39th. St., Pittsburgh, Pa. and the Brighton Works at New Brighton, Pa. They are one of the largest makers of bronze castings in the United States and are specialists in bronze castings for blast furnace work.

The various subsidiary plants of the American Brass Co., of Waterbury, Conn., have been changed in name so that the business will not be separated as heretofore. The names of the plants altered are as follows: The Coe Brass Mfg. Co., the Ansonia Brass & Copper Co., the Coe Brass Mfg. Co., of Ansonia, the Benedict & Burnham Mfg. Co. of Waterbury and the Waterbury Brass Co., will all be known as the "Branch" plants of the American Brass Co. It is expected that by having a main selling organization much unnecessary clerical work can be saved and delays avoided in communications and shipments.

The Marsh Automatic Soda Fountain Co., has been incorporated in Detroit, Mich., with a capital stock of $50,000 to manufacture soda fountains and accessories.

The Branford Foundry Co. Inc., of Branford, Conn., has recently been started at Branford, Conn., for the manufacture of iron and brass castings. Geo. W. Hull is the superintendent. The office and plant of the company is on Main St.

The Anderson Brass Company has been organized in Anderson, Ind., by J. B. Hart, W. C. Hogwood and G. W. Hogwood. The manufacture of brass and aluminum goods will be carried on and quarters have already been obtained.

The Ansonia Electrical Co., Ansonia, Conn., manufacturers of electrical goods, insulated wire and similar products, are about to equip a plant at their works for carrying on electroplating. They are now making a line of sockets, switches and similar goods which require plating.

The Jackson Brass Foundry Company of Jackson, Mich., has acquired the plant of the Wolverine Aluminum & Brass Foundries of that city, and has amalgamated it with its own. The Wolverine Company is to be dissolved and the affairs wound up. The plant of the Jackson Brass Foundry Co. is to be enlarged. W. W. Wright is the president of the company and Joseph Gerson secretary.

The Brown Instrument Co., Philadelphia, Pa., manufacturers of pyrometers, desires the opportunity to send their catalogues and price list of the pyrometers which they manufacture to those who are interested in measuring the temperatures of molten metals, annealing muffles and furnaces in general. This company were the first to manufacture pyrometers in the United States.

The Tube Bending Machine Co. of Baltimore, Md., are sending out to the trade a circular describing the new automatic grinding and polishing machine for pipe, tube and rod which they are now placing upon the market. This company moved from Newark, N. J., to Baltimore, Md., some time ago where a new factory was equipped. This plant is situated at 1300 Bayard St. The circular will be sent to those who wish it and everyone interested in polishing tubing, rod or pipe should investigate it.

The Baird Mochine Co. of Bridgeport, Conn., manufacturers of the "Baird" steel ball burnishing barrel for burnishing small metal goods by means of steel balls, and automatic and special machinery for making small metal goods, have just issued a small booklet describing the line of goods they manufacture. This book is of much interest and contains useful information. It will be sent to those who desire it and will advise the Baird Machine Co. to this effect. This company are now located in their new plant and which is one of the finest in the country for their line of manufacturing.

The Chicago Insulated Wire Co., of Chicago, Ill., manufacturers of insulated copper wire, has moved to Sycamore, Ill.

Geo. F. Cook, 462 Broadway, Albany, N. Y., is to retire from the gold and silver plating business which he has followed for thirty-three years.

The Youngstown Bronze & Iron Foundry Co. of Youngstown, Ohio, recently completed the new addition to their plant in that city. This foundry addition is 100 x 136 feet.

William H. Friedman, manufacturer of manicure sets and also carrying on jobbing plating at 17 Liberty St., Albany, N. Y., has moved to the Union Trust Bldg., Harrisburg, Pa.

The Specialty Brass Co., has been incorporated at Pleasant Prairie, Wis., with a capital stock of $25,000. The incorporators are Henry Anderson, John Anderson and Lars C. Thomsen.

The Worcester Pressed Steel Co., ofWorcester, Mass., manufacturers of pressed sheet steel goods and who also operate a nickel plating plant, are to build a new rolling mill for rolling sheet metal. It is expected that the new mill will contain five stands of rolls. The building is to be 100 x 200 feet.

The Enos Company, 7th. Ave. and 16th. Sts., New York City, one of the largest manufacturers of chandeliers, gas fixtures and lighting appliances in the United States, and which recently went into bankruptcy, is still in the hands of the Trustee who expects to be able to settle up the affairs within a short time.

The Anchor Brass & Aluminum Company has been incorporated in Cincinnati, Ohio with a capital stock of $10,000. All kinds of brass, bronze and aluminum castings will be made and a new foundry will be built at or near Cincinnati. Gustav A. Wendt, formerly with the Ohio Pattern Works is one of the incorporators of the new company. For the present, quarters have been obtained on Colerain Ave.

The Forsyth Metal Goods Co., has been incorporated at Buffalo, N. Y., with a capital stock of $30,000 to take over the business of the Forsyth Mfg. Co., of that city, manufacturers of bath-room fixtures, hardware specialties, etc. The plant will eventually be enlarged. The officers of the new company are: President, J. H. Price; vice-president and general manager, H. B. Rose; and secretary, D. N. Whittington.

Charles R. Crane has been elected president of the Crane Company of Chicago, Ill., the largest manufacturer of valves and steam goods in the United States, to succeed his father, the late R. T. Crane. The other officers elected were as follows: R. T. Crane, Jr., first vice-president; R. T. Crane, 3rd., second vice-president; A. D. MacGill, treasurer; R. B. Stiles, assistant-treasurer; J. B. Berryman, secretary; R. W. Leatherbee, assistant-secretary. The directors include the foregoing officers with J. C. Kilgore and W. W. Doolittle.

The P. A. Coon Silver Co. of Syracuse, N. Y., manufacturers of silver plated hollowware, are to erect a factory at Los Angeles, Cal., and will manufacture their full line of goods at this place. It is stated that 100 hands will be employed when the factory is in operation. The new factory will be one story high and of brick.

The Celluloid Zapon Co., Metropolitan Bldg. New York City, the well known lacquer manufacturers, are sending out to their friends a bull-dog paper weight and which has been finished with their "French-Ivory" finish that is now so popular. These white finishes are now extensively used and form a new line of finishes heretofore believed impossible except with non-metallic substances.

The United States Chemical Co., 3621 Lakeside Ave., N. E. Cleveland, Ohio, are now manufacturing "Perfection Grease" which is the best lubricant for stop and waste cocks, faucets and gas cocks and appliances. It has the advantage of not becoming hard in ten years and will not cement the plugs. It contains no rosin or varnish gums and samples will be sent upon request.

The Waterbury Metal Products Co., of Waterbury, Conn., desire the opportunity to quote on all kinds of jobbing plating and polishing, or special finishes on metal goods. They also carry on the following special lines of work: Mirror finish on hardened chair casters and buttons, McKinley gold plate, 14K non-tarnishable gilt. They also act as consulting platers. They have a well equipped factory at 23 Jefferson St., in that city and solicit inquiries on any matters regarding plating or the finishing of metal goods.

Obituary.

Franklin Farrel, president of the Farrel Foundry & Machine Co., of Ansonia, Conn., died on Jan. 10th, aged 84 years. Mr. Farrel was one of the leading citizens and manufacturers of the Naugatuck Valley and has been identified with the manufacturing trade in that section for many years. At an early age he learned the trade of millwright and assisted in constructing the copper mill of the Ansonia Brass & Copper Co., for Anson G. Phelps. At that time he prepared a map of Ansonia which is still in the possession of the family and which was the first ever made. Mr. Farrel was not only identified with the company bearing his name, but with many other of the large concerns in the Valley. He was also extensively interested in copper mining at one time and was a heavy stockholder in the Parrot mine of Butte, Montana. This proved to be a most successful venture. Mr. Farrel was a brother-in-law of Charles F. Brooker, president of the American Brass Co. In addition to the widow, he left one son, Franklin Farrel Jr., of the Farrel Foundry and Machine Co., and four daughters.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.19
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.07¼
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.14¼
Copper, Lake, (cask)	lb.	.14½
Copper, Electrolytic, (carload)	lb.	.14
Copper, Electrolytic, (cask)	lb.	.14¼
Copper, Casting, (carload)	lb.	.13¾
Copper, Casting, (cask)	lb.	.14
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor Spar	lb.	.01¼
Fusel Oil	gal.	3.50
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron, Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.44½
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.45
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	25.00
Platinum Metallic	oz.	46.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.58⅝
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.13¾
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.06½

THE BRASS WORLD AND PLATERS' GUIDE

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A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.

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Contents for March.

Aluminum, Purifying..... 105
Brass and Bronze Plating Solutions..... 95
Brass Foundry Mixtures, Standard 83
Brass, Season Cracks in Sheet 81
Brass Solution, Copper Anodes in a 80
Cadmium in the United States..... 89
Carbureters, Mixture for..... 84
Centrifugal Process for Purifying Aluminum 105
Chain-Links, New Process of Soldering.. 86
Copper Anodes in Brass Solutions..... 80
Corundum 93
Crucibles for Melting Platinum, Lime... 82
Crucibles in Oil Furnaces, Life of..... 91
Cyanide Solutions, Effect of Electric Current on 92
Electrotyping, Improvement in..... 91
Furnaces, Graphite Crucibles in Oil..... 91
Galvanizing 100
Hollow-Ware, New Method of Shaping .. 86
Molders' Bench, Improved Form of 79
Nickel Alloy, New Malleable 80
Nickel Solution, New Black..... 82
Platinum, Lime Crucibles for Melting.... 82
Pyrometer with Illuminated Dial..... 90
Season-Cracks in Brass, Peculiar Case of 81
Silver Plating Solutions, Old 78
Silver Anodes, Purity in..... 87
Tin, "Infected" 77
Tin, Disintegration of Metallic..... 96
"Tin-Pest", The..... 77
Tungsten, Increasing Ductility of..... 105
Valves, Mixture for 83
Zinc Plating Solution, New..... 105

Infected Tin (the "Tin-Pest") and Its Bearing on Other Metals.

It has been known for some time that metallic tin, when exposed to a very low temperature, becomes brittle, but other than this generality, little has been known. In an extensive and very interesting paper, abstract of which is published in this issue, Prof. Ernst Cohen of the University of Utrecht, has investigated the subject both historically and experimentally and has discovered some very interesting information. Not only is it of value in the metallurgy of tin, but would seem to indicate that the cause of the decay or disintegration of other metals, notably that of brass, may be caused by the same agency.

Prof. Cohen found that all metallic tin is subject to decay or disintegration when exposed to a low temperature and the purer it is, the more readily it decays. This decay is, in reality, a crumbling to powder and when the tin is exposed to the low temperature for some time it crumbles to a gray, granular mass. This decay is called the "tin-pest" and the gray tin that results when the pure metal is exposed to a low temperature has been found by the author to be an allotropic form of tin. That this is so, is indicated by the fact that it can be changed to white and malleable tin by simple melting.

The researches of Prof. Cohen have demonstrated the following:

1. That metallic tin exposed to a low temperature will gradually change to the allotropic or gray form of tin in the shape of

powder. Massive tin will become granular. Sheet metal may become perforated by the formation of the "tin-pest".

2. That the lower the temperature the more rapid the decay of the tin. It is stated by the author that it should be kept above 18° C. as this seems to be the point of transition.

3. That the granular, gray tin resulting from the decay of white tin is only an allotropic form of tin as it may be changed to the white variety by simple melting.

4. When the tin decays to the gray powder, it increases in volume.

5. The decay of tin may be brought about or hastened by *infection*. If white tin be brought in contact with a trace of the gray powder, resulting from the decay of another mass, the decay takes place at this point and gradually increases in volume. This fact is one of the most remarkable of them all as it indicates an analogy in metallurgy to that of diseases of the human race. The germ theory of disease is based upon the fact that the disease may be transmitted from one person to another by the germ itself, either by infection or contagion, and it has been shown by this writer that metals can also become diseased by infection in the same manner.

The investigations published in the paper are of the utmost importance as they open a new field for research and suggest a cause for some of the perplexing problems encountered in non-ferrous metallurgy. It would seem, however, that many of the causes of disintegration in metals and alloys are really the nature of the metal or alloy itself, and not brought about by any external influences.

Old Silver Plating Solutions.

Owing to the cost of silver, manufacturers are apt to use a silver plating solution longer than any other. This is frequently false economy for the reason that silver refiners will always purchase the solution and pay for the silver it contains. When this is done, it frequently happens that while an old nickel or cyanide copper solution may be a total loss, there is always some salvage in a silver solution.

Silver solutions are made by dissolving either the chloride or cyanide of silver in potassium cyanide. The action of the current and the air change the cyanide, first to cyanate and then to carbonate of potassium. As the solution becomes older, the amount of potassium carbonate in it gradually increases until, when it is very old, the quantity becomes excessive. It then happens that the solution may stand from 20 to 25 degrees Beaumé and still have very little silver and free cyanide in it. The potassium carbonate in the solution is the cause. This is called an *inert* material as it has no use in the silver plating operation. Potassium carbonate (or sodium and potassium carbonates, if sodium cyanide is present when the double cyanide is used), then, is the foreign matter that causes a silver solution to become "old."

The action of an excess of potassium carbonate in a silver plating solution is to cause a rough and streaked deposit. Old silver solutions that are full of it rarely work well, although they may do for some classes of work and many are using them. How long such a solution can be used is difficult to say, but it is believed that many platers use their solutions too long. If the deposit comes rough and streaked, and the solution is old; and at the same time it contains practically the normal amount of silver and free cyanide, then it is probable, if the current density is right, that the solution is too old for further use and is filled with inert salts.

It is always a fact that old solutions have a dark color and resemble a dark wine or old ale. It is also almost always the case that these solutions contain considerable copper. It has been demonstrated that copper, at the current density used for silver, does not deposit, but remains in the solution. All silver anodes contain a little copper so that the copper in the solution is constantly increasing. If a silver plating solution contains a large amount of copper, it almost invariably indicates that it is old, and it will be found that the color of such a solution is quite dark.

Old solutions can be regenerated by means of barium cyanide, but this substance cannot be obtained commercially except at a high price which prohibits its use. When a silver plating solution becomes too old for use, therefore, there is but one thing to do, and that is to sell it for the silver it contains and make a new one. When the time is ripe for this to be done will have to rest with the plater.

An Improved Form of Molder's Bench.

The ordinary form of bench for brass molders' use is in the shape of a rectangular box, the front of which slopes so that it is narrower at the bottom. This renders it easier for the molder to work at it. This appliance is known as a "molder's bench" and hence the name "bench-molder" has been derived. It is used by brass molders for small work. This type of molder's bench has been in use for probably a hundred years, and as far as known, without any modification or change. Possibly the sloping front may be an improvement. To be sure, the bench is very satisfactory, otherwise it could not have been used so long, but molders, as a rule are not given much to inventions and, therefore, the bench has remained unchanged for many years.

The molder's bench herewith shown is the invention of Victor Lassen, factory manager of the Vanadium Metals Co., of Groton, Conn., and the new foundry has been equipped with them. It has been found satisfactory and molders say they find it easier to work on it.

The bench really needs no explanation, but it will be noticed that the sand, as it is scraped from the flask falls down a chute to the floor where it is convenient to mix and riddle it. The pecular advantages of the bench lie in the shape and a glance at it will serve to indicate the superiority. Mr. Lassen constructed the bench for his own foundry and it has been in use for a sufficient length of time to demonstrate its advantage over the old form of molder's bench.

The top of the bench is composed of strips of wood and are fastened so that there is a space between them. This allows the sand to fall down the chute and does not interfere with the molding at all. The top of the bench is in the form of a shelf so that the molder may place his tools, dust-bag and other appliances on it. A space is provided at the left underneath the bench for storage of flasks, boards, etc. The bench can be more cheaply constructed than the ordinary molder's bench and has been found far more satisfactory.

Improved form of Molders' Bench as Used at the Foundry of the Vanadium Metals Co., Groton, Conn.

Use of Copper Anodes in a Brass Solution.

Platers are beginning to appreciate the advantage of using copper anodes in a brass solution, and they are now to be found in many establishments doing brass plating. Upon first thought, one would naturally think that a brass anode would be better than a copper one for use in a brass solution as it would feed copper and zinc in the right proportions. The idea is wrong, however, as it does not do so in the manner desired.

The disadvantage of a brass anode in a brass solution is that it is not as readily dissolved, while the deposition of the brass is going on, as a copper one. Copper is more soluble in cyanide than brass. Therefore, there is a tendency for a brass anode to coat over with a slime which impedes the progress of the current and alters the color of the brass deposit.

Copper is much more readily attacked by cyanide than brass and, therefore, when copper anodes are used in a brass solution, they do not coat over as quickly and there is then no need of having as much free cyanide in the bath. As very little slime forms on the copper anode, the current is not impeded and the electrodeposition of the brass proceeds regularly without change in color. The slime that forms on a brass anode and interferes with the passage of the current causes the brass to change color on the work. The reason for this is the fact that the slime acts as an insulator and prevents, to a greater or less extent, the passage of the electric current from the anode to the cathode. As the current then decreases, the deposit changes on account of the fact that a certain current density is necessary for the deposition of brass of a certain color.

In the use of copper anodes in a brass solution, rolled anodes are preferred as they wear away more evenly than cast ones and there is less waste. As they feed the solution with copper, there is seldom need for adding carbonate of copper to the solution. All that needs be added is carbonate of zinc, and this is easily done by watching the color of the deposit. If it approaches a bronze, or traces of red are indicated, then more carbonate of zinc is necessary.

As far as known, W. G. Stratton was the first to use copper anodes in a brass solution, and he has used them very successfully for many years. Many other Eastern platers have, at his suggestion, used them and have found them very advantageous in promoting the uniformity of working in the brass solution.

A New White, Non-Corrosive and Malleable Iron-Nickel-Copper Alloy.

A new white, non-corrosive and malleable alloy of iron, nickel and copper has been patented* by G. H. Clamer of the Ajax Metal Co., of Philadelphia, Pa. This alloy may be rolled into sheet, rods or bars, or drawn into wire. It may also be cast in sand.

This alloy has a whitish color and can be made in the following range of percentages:

Iron	30% to 70%
Nickel	25% to 50%
Copper	5% to 20%

The inventor states that pure copper and iron will alloy in all proportions and form a homogeneous mixture; but when carbon is present, as it is in steel or cast-iron, the two metals do not alloy well and hard nodules separate, depending upon the quantity of carbon. When cast-iron is used for alloying with copper, there is almost a perfect separation. In the alloys patented, it is stated that carbon should not be present to any extent or there will be a separation of hard nodules in the metal. If, however, carbon is present, then the tensile strength of the alloy is increased, but the quantity should not exceed 0.2% in order to have the best conditions.

The strength of the alloy is high and the inventor states that a mixture of the following approximate proportions:

Iron	65%
Nickel	25%
Copper	10%
Carbon	0.2%

has the following physical properties:

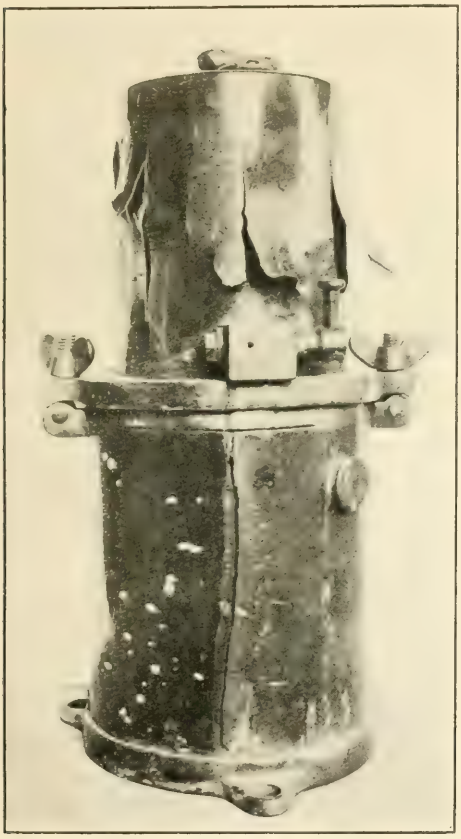
Tensile Strength	96,100 lbs. sq. in.
Elastic Limit	51,750 lbs. sq. in.
Elongation in 2 in	42%
Reduction in Area	53.7%

To make the alloy, the metals are melted so that carbon is kept low and a small amount of manganese or magnesium added for deoxidizing purposes.

*U. S. Patent, 1,016,540, Feb. 6th, 1912.

A Peculiar Case of Season Cracks in Sheet Brass.

One of the peculiar obstacles frequently met with in the use of sheet brass is the formation of cracks in the surface after the article composed of the brass has been in use for some time. Many an article has been ruined on this account.



Acetylene Generator. Made of Sheet Brass and Which Season-Cracked Within a Short Time as Noticed.

Season-cracks seem to be simply a sort of crystallization in the metal for the fracture of the brass shows a crystalline structure when examined and the metal is more or less brittle around it. The fact that brass will crystallize or season-crack under some conditions and not under others indicates that the brass itself is not always at fault. External influences, it is believed, have a much greater bearing on the subject than usually believed.

In the photograph herewith reproduced, is shown an acetylene generator of drawn brass which cracked as seen within a few months after use. A singular thing in connection with the cracking was that the dealers, who sold the generator (maker of the generator was unknown) maintained that it had frozen and the expansion of the ice had caused the cracks! The fact was, the generator was used only for a short time during the summer months.

There are a number of things that will bring about season-cracks in sheet brass, wire or tubing and among them are solutions which contain or evolve ammonia. For a reason not clear, ammoniacal compounds seem to affect the brass in this manner. One would naturally expect, however, that in the generating of acetylene gas from calcium carbide that there would be no ammonia produced, but such is not the case. Impurities in the calcium carbide in the form of nitrogen compounds, form ammonia when it comes in contact with water. It is believed that these compounds of ammonia are the cause of the cracking of many kinds of brass goods as it was in the case of the acetylene generator herewith shown.

Other agencies which will cause the season-cracking of brass are mercury or mercurial compounds. This, as well as the ammonia are external influences but a very common internal one is the shape of the dies which are used for drawing the brass shell. It is now well known that in order to prevent season-cracking (or firecracking during the annealing) the brass shall actually be drawn out ("ironed" out, so to speak) by the punch so that the metal is really stretched. It will not suffice to merely form the brass, but it must be stretched. This fact is well known in the brass trade, but many outside, of course, are ignorant of it. It is not believed, however, that this was the cause of the cracking of the acetylene generator as it had been in stock for a long time before being used, and had not cracked.

It is practically impossible to obtain yellow brass scrap on the market that is free from lead, as it is always returned to the brass rolling mills who are anxious to obtain it. The yellow brass scrap found in the scrap market is nearly all leaded and screw-rod chips compose the principal supply. These always contain lead.

Lime Crucibles for Melting Platinum.

Large quantities of platinum are now used in the manufacture of jewelry. It is, therefore, frequently desired to melt small quantities of the metal in order to reclaim scrap or make alloys.

For melting platinum, lime has been found the most satisfactory material for the crucible and is now almost exclusively used for this purpose. It is about the only material that will stand the high heat of the blowpipe used for melting the metal.

The lime used is regular burnt lime and not the limestone. Large selected pieces should be used and as free from fissures and foreign matter as possible. A lump is selected and the cavity is cut in it for holding the platinum. This lime crucible, then, is used for melting the platinum. An oxy-hydrogen blowpipe is source of heat and the platinum is melted in the cavity cut in the lime. After it has been melted, the molten platinum is allowed to cool in the lime and no attempt is made to pour it. This has been found most expedient and the button of platinum thus obtained is hammered, if necessary, until it is thin enough to enter a pair of rolls for rolling into sheet.

New Formulas for Steel or Iron Enameling.

Two new formulas for enameling iron or steel have recently been patented by two inventors*, and which are intended for the protection of these metals from rust. In the process two formulas are employed:

Formula A.

Powdered glass	40 lbs.
Borax	20 lbs.
Saltpeter	10 lbs.
Feldspar	5 lbs.
Cobalt oxid (black)	2½ ounces

Formula B.

Borax	23 lbs.
Feldspar	30 lbs.
Soda	7 lbs.
Saltpeter	3 lbs.
Silica	38 lbs.
Tin oxid	12 lbs.
Cryolite	18 lbs.

*David V. York of North Grove, Ind., and Justus A. Tinker of Cleveland, Ohio.

The ingredients comprised in the foregoing Formula A, viz: powdered glass, borax, saltpeter, feldspar and black cobalt oxid, are first mixed and then melted into a mass. The said mass is then reduced to a fine powder, and such powder is mixed with water and approximately eight pounds of clay.

The ingredients of Formula B, viz: borax, feldspar, soda, saltpeter, silica, tin oxid and cryolite are first mixed and then melted into a mass, which mass is ground to a fine powder and is mixed with water and approximately eight pounds of clay.

After the steel is cleaned with acid or sand blast the first of the mixtures described—*i. e.*, that containing Formula A, is applied in a coat of suitable thickness to the surface of the steel, and then the coated article is dried and burned in the presence of heat ranging from 1600 to 1800 degrees Fahrenheit, or sufficient heat to assure the enamel adhering to the steel and having a smooth and glossy surface. Then the coated article is cooled, whereupon a coat of the second-named mixture—*i. e.*, that containing Formula B, is applied to the first coat, and the article is dried and burned in the same manner as before, in the presence of heat varying from 1600 to 1800 degrees Fahrenheit. The application of the first coat described to the article to be enameled serves to assure the adherence of the second coat to the article and in that way contributes to the finish and the durability of the enamel as a whole. If the desired result is not attained with one coat of the mixture containing the Formula B, another coat of said mixture is applied and dried and burned in the manner described.

Steel enameled by the process set forth is possessed of all the qualifications hereinbefore stated, and may therefore be used to advantage in caskets and vaults for burial purposes, for the outer or facing surface of concrete, brick and tile structures, and for ceilings, sidewalks, wainscoting, swimming pools and other tanks, sinks and vats, counter and table coverings, soda fountains, tea and coffee urns, cooking utensils, etc.

Copper and iron alloy in all proportions if there is no carbon in the iron, but when it is present (as in steel, for example) hard nodules separate from the alloy formed. On this account, the alloying of iron and copper has never been a commercial success.

Standard Brass Foundry Mixtures and Method of Making Them.

By Erwin S. Sperry.

(*Continued from Page 47, February, 1912*)

Steam Metal Valves.

Valve metal to stand steam pressure is one of the most exacting requirements of any of the red metal mixtures. The requirements are:

1. The casting must stand pressure without leakage.

2. The metal must be of sufficient strength to prevent distortion when the valve is screwed on to the pipe.

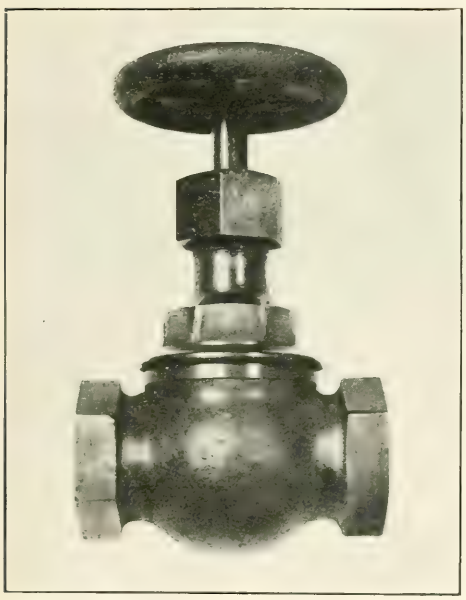


Fig. 1. Steam-Metal Valve as Illustrating Valve Mixture.

3. The mixture must not be brittle, but must be tough and stand bending without breakage.

4. It must be non-corrosive so that it will not be acted upon to any extent by steam or water.

5. And last, but not least, the metal must machine freely so that high speed automatic tools can be used upon it.

A good tin-bronze, of course, must be used for making valves. Yellow brass is unsuited as it does not stand the pressure well and a large percentage of leakages result. It is also too soft. No one would think of making a steam valve of yellow brass for it could not be sold. The consumer expects red metal.

Much scrap is used in making valves at the present time and when this is the case, the valve manufacturer does not work to any particular mixture; but even though this be so, it has been found advantageous to use new metals for making the bodies and hubs as the leakages are then much less than when scrap is used. It is now common practice in the majority of establishments to make the bodies and hubs of new metal, and if scrap is employed at all, to use it on the other unimportant parts such as the stuffing box, spindle, etc. In the making of valves, the leakage under pressure when tested is the greatest obstacle encountered, and this is paramount to everything else. It is rare, indeed, that the loss from leakage can be kept down below 5 per-cent, and frequently rises to 15 and 20 per-cent. The method of melting, casting, and molding have more to do with the leakage than the mixture, although a poor mixture, ill adapted for the purpose will cause more leakages than a good one. The best mixture for steam metal valves is as follows:

Steam-Metal Valve Mixture.

Copper	87 lbs.	or 870 grams
Tin	7 lbs.	or 70 grams
Zinc	3 lbs.	or 30 grams
Lead	3 lbs.	or 30 grams
Total....	100 lbs.	or 1000 grams

If the quantity of tin in the mixture is increased much above the given amount, the mixture becomes too hard to machine with the tools usually employed. The quantity of zinc should be kept at about 3% as any greater quantity tends to produce more dross, thus rendering the castings dirty and the leakages then increase. If the lead is increased much above that given, the metal becomes weak although the cutting qualities are improved. It has been found advisable to keep the lead to about 3% in order to obtain a tough mixture which will machine well and yet will not break under the severe punishment given the valve by the steam-fitter.

There are many different mixtures in use for making valves and for the common kind of work, ordinary "Composition" is used; but the leading makers of valves employ, for the best class of work practically the mixture previously given. It has been found to answer the requirements regarding non-corro-

sive properties, strength, cutting qualities and cost, and at the same time has excellent casting properties so that the percentage of leakages will be reduced to the smallest possible number if normal foundry conditions have been obtained. For a good steam-metal mixture let it be used. For a cheaper one, use the mixture for "Composition" given in THE BRASS WORLD, February, 1912, page 44.

Gears.

Bronze gears are now used to a much less extent than formerly on account of the progress that has been made in making them of steel. When cast-iron was so extensively employed in structural work, bronze gears were always used when a tough material was necessary, as steel castings had not then come into extensive use. Bronze gears are

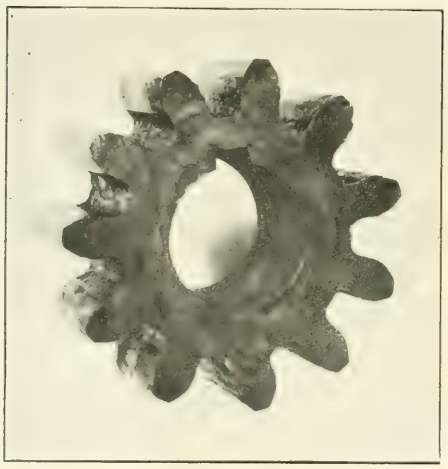


Fig. 2. Illustrating Mixture for Gears.

still used to some extent, but manganese-bronze, or other similar strong bronzes are now largely employed. There are many instances, however, in which a good, strong and tough tin-bronze mixture is advantageous, both on account of casting qualities and non-corrosive properties. The following will be found excellent for this purpose.

Mixture for Gears.

Copper	88 lbs. or 880 grams
Tin	10 lbs. or 100 grams
Zinc	2 lbs. or 20 grams
Total	100 lbs. or 1000 grams

This mixture is tough and hard and casts exceptionally well, and is quite non-corrosive. Lead should not be used in it as it weakens it, particularly in the matter of toughness. The mixture will be practically as hard with a small lead content, but the teeth will not stand the shock and strain as well as the mixture free from it. Gears are rarely made on automatic, high speed tools, but on those adapted for cutting steel or iron, so that there will be little difficulty experienced in cutting the gear in the finishing operation.

Electrical Fittings.

The manufacture of electrical castings is now a large business in the brass foundry trade and it consists of numberless small

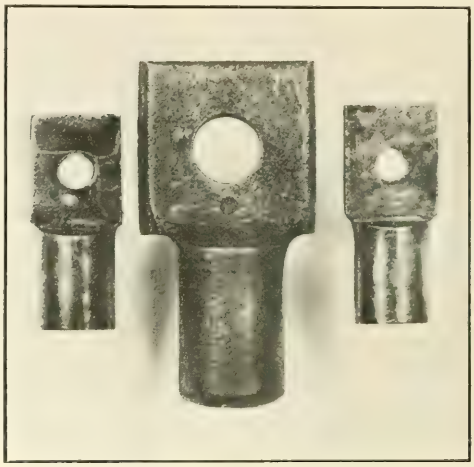


Fig. 3. Articles Indicating Mixture for Electrical Fittings.

parts of switches, motors, rheostats, etc. As copper is so extensively employed in electrical work, the demand for the castings is that they shall be red, in order to match. A yellow casting on an article made principally of copper does not look well. Many manufacturers, in order to reduce costs as much as possible use yellow brass castings, and copper plate them. This does very well for cheap work, but the best class of work requires solid red metal castings.

Pure copper is unnecessary for this work (except in rare instances) and a red bronze that is red answers. The following mixture is suitable for this class of work:

Mixture for Electrical Fittings.

Copper	93 lbs. or 930 grams
Tin	3 lbs. or 30 grams
Zinc	2 lbs. or 20 grams
Lead	2 lbs. or 20 grams
Total	100 lbs. or 1000 grams

This mixture is soft, but a hard mixture cannot be obtained with a red color and not have it soft. If tin, or zinc is added in sufficient amounts to harden the mixture, the color becomes that of bronze or brass. It is necessary, therefore, to have a soft mixture.

Carbureters.

The advent of the gasoline engine has created the carbureter. It is the lungs of the engine and in it the gasoline and air are mixed in the right proportions to produce the necessary explosive mixture which is drawn into the cylinders. An ordinary carbureter

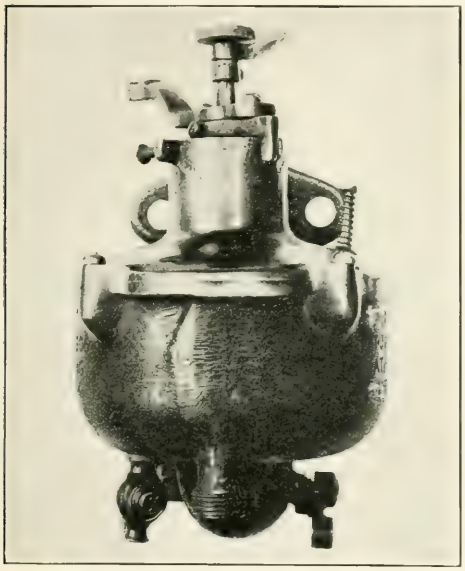


Fig. 4. Carbureter for Which Mixture Given is Used.

casting is an intricate one and should always be made of the best red-metal mixture for the purpose. The metal must run sharp and free as there are complicated cores which leave little thickness to the casting, and it must also produce a carbureter that will not leak when tested. The best mixture for making carbureters is that used for making steam-metal valves as the requirements are the same. The carbureter, however, is a much more complicated casting and its walls are much thinner so that the mixture must run as sharp and free as possible. The regular steam-metal mixture, however, is all that can be desired in this respect. It is as follows:

Mixture for Carbureters.

Copper	87 lbs. or	870 grams
Tin	7 lbs. or	70 grams
Zinc	3 lbs. or	30 grams
Lead	3 lbs. or	30 grams
Total	100 lbs. or	1000 grams

In making a carbureter, there is nothing to be gained by the use of scrap and new metal is always advocated. The casting is usually so complicated that, like the casting of statuary, no economy on the metal is advisable. Considerable machine work is done on the carbureter and the preceeding mixture will be found all that is required in this respect.

Name-Plates.

Bronze name plates are used less extensively than formerly on account of the cheapness of the etched brass name plate now made in such large quantities. There is no question about the vast superiority of the cast plate, but it is much more costly than the etched article. For durability the cast plate

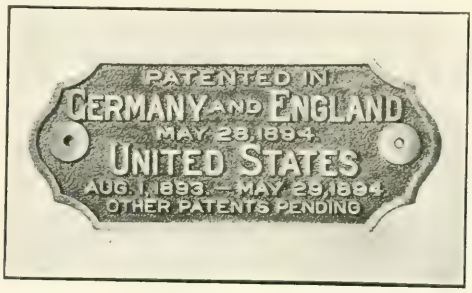


Fig. 5. Name-Plates for Which Name-Plate Mixture is Used.

is much superior to the etched plate and will, of course, last indefinitely. The etched plate, however, is usually short-lived as the oxidized background sooner or later becomes rubbed off leaving the whole plate of one color and the letters then, owing to their slight relief, become quite inconspicuous. It is believed that the cast plate will later come into more extensive use, as manufacturers of machinery, who were formerly large consumers of it, are now beginning to appreciate its superiority, even if it is more costly, over the etched plate.

The requirements of a bronze name plate are that it shall be of a bronze color and show the letters in sharp relief. A good red mixture containing considerable zinc and a small amount of tin is quite suitable and the following is the mixture:

Mixture for Name-Plates.

Copper	86 lbs. or	860 grams
Tin	3 lbs. or	30 grams
Zinc	9 lbs. or	90 grams
Lead	2 lbs. or	20 grams
Total	100 lbs. or	1000 grams

The lead is used in the mixture to "soften" the metal so that it can be drilled for the holes without difficulty, and also to render the grinding of the face easier. In grinding, the lead acts as it does when the metal is cut and there is then no tendency for the surface to become torn.

(*To be continued in the next issue*)

A Method of Shaping Hollow-Ware.

An improved method of shaping hollow-ware has been invented and patented by John F. Lewis of Philadelphia, Pa. and which is herewith illustrated. The medium for shaping the article is water and this is employed for forcing the sheet metal into the die.

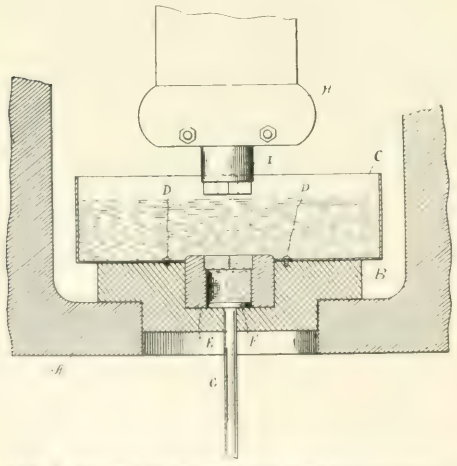


Fig. 1. Method of Shaping the Grease-Cup in the Water-Die.

The illustrations indicated show the apparatus equipped for the manufacture of a grease cup. In Fig. 2 is shown this cup both before and after shaping. In Fig. 1 is shown the press and the die is indicated by E. In the bottom of the die is the ejector F which is used for removing the article from the die after finished. The stem G, is simply fitted to a foot treadle which, when pressed pushes the article out of the die.

The article to be formed, like the shell shown in the right hand of Fig. 2 and which has previously been formed in an ordinary drawing press, is placed in the die, the reservoir C filled with water and the plunger I brought down. The water, being forced inside

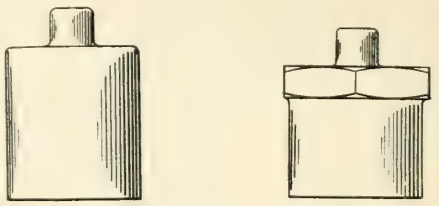


Fig. 2. The Grease-Cup Before and After Shaping in the Water-Die.

the shell, expands it and produces the hexagon as shown in the left hand illustration of Fig. 2. Other shapes may be made as well as the one shown in the sketch.

A New Process of Soldering Chain Links.

A new process of soldering chain links has just been patented by Eugen Speidel of Pforzheim, Germany. It is applied to that class of links ,consisting of a core of hard solder inside of a hollow wire of gold or other metal. When such links are soldered in the usual manner, the solder spreads beyond the joint making it expensive to remove.

In this process the solder is prevented from spreading in the following way: The links are first coated with borax or boracic acid and then heated to fuse it. They are then tumbled or brushed so that the excess of this flux on the outside is removed, leaving it only on the faces of the joint.

The link is next treated with a solution of liver of sulphur which turns the metal black near the joint. The metal may be oxidized with any other solution if desired, as any oxide or sulphide on the surface effectually prevents the solder from spreading.

The links are then heated to fuse the solder. The flux, being on the faces of the joint, while the oxide or sulphide on the surface near the joint prevents the solder from spreading.

Purity as a Requisite in Silver Anodes.*

By J. L. R. Brown.†

It seems to me the best way to show that "purity" is a requisite in a silver anode, is to point out some of the bad results arising from the use of impure silver, all of which results might have been avoided by the use of silver prepared for the purpose of plating and fully guaranteed.

I am sure you have all, (especially in the old days) had the disagreeable experience of contending with the presence of a black film on the surface of your silver anodes, attached so lightly that unless so carefully handled it would float off into the solution, but which no amount of work on your part, such as altering resistances, changing solution conditions or the many things one would do on occasions of this sort, could prevent. You could only carefully remove them, wash thoroughly and replace and continue this operation until the anodes were consumed. Not all of the anodes would work by this treatment, and frequently only a portion of the surface would turn black. It would form in streaks, alternating with clear portions, and under these conditions the free cyanide would act correctly on parts of the surface and very little, if at all, on others; and at times eating through the anodes in the clean portions causing the black, where surrounded by the clean, to become detached and sink to the bottom of the tank. The ideal way for an anode to go into solution is, of course, to dissolve evenly all over the surface and to disappear from the edges, preserving the contour in the form of a regular curve.

The appearance of the silver before using is no guide in determining whether the anode will work white or not, as the surface of one which will work black is as clean and white before going into the solution as any that is perfectly pure. In fact, there is little doubt that the silver entering into the black anode is 999 fine, which is necessary for it to be in order to be sold as "commercial silver." The term "999 fine", however, simply means that, in every thousand ounces of bullion you purchase, there are nine hundred and ninty-nine ounces of pure silver and one ounce of alloy. When this ounce of alloy is all or partly insoluble matter, the action of the free cyanide in the solution is to dissolve out all of the silver in the anode, and leave the insoluble matter in the shape of a black film on the surface. This will accumulate so rapidly when the anode is bad as to necessitate removal and cleaning as often as once a day.

I realize that silver anodes will turn black, when the silver from which they were made is absolutely right. This may arise from a number of conditions, such as the action of the sulphur in a bright silver solution, too high current density for the work being plated, or too much or poor quality of cyanide. When the discoloration arises from faulty conditions in the plating room, it has a different shade and is easily distinguished; and a good plater can easily discover the cause and apply the remedy. The only remedy I have ever heard for a black anode where the silver was bad, was to replace it with a good one.

Among the bad results arising from the use of impure silver, may be mentioned the following:

The increasing amount of resistance caused by the black film lessens the rate of silver deposition, and in the absence of scales at the plating tanks, you give your customer a lighter plate than intended, or else if you are careful to get the weight of silver on the goods, it takes so much longer to do so that the output of your department is much lowered.

Another thing, the presence of this film retards the dissolving action of the free cyanide in your solution, and to a slight degree the anode becomes neutral and you plate the silver out of your solution at a greater rate than the free cyanide can replace it from the anode. I believe the first impulse of a plater, under this condition, is to increase the amount of free cyanide so as to take up the silver faster. This, however, is only palliative and accomplishes no lasting good, as your solution is soon out of balance, and requires refining and replacing by a new one.

One member of this Association has told me of his solutions which have been in use

*An address made at the Banquet of the National Electroplaters' Association, held in New York City, Feb. 10th, 1912.

†Asst. General Manager, Handy & Harman, Bridgeport, Conn.

nearly five years, and the quality of the anodes has been so uniformly good, that in all that time, he has not been obliged to supply any silver salts.

When the periodic cleaning of the black anode is neglected, the film becomes thick and floats off into the solution and not only contaminates it, but the dirt is carried over on the work. This makes it necessary to remove the goods and clean them, with the danger of getting grease on the surface and interfering with the smoothness of the plate. If the dirt gets on the goods and is not noticed, it becomes plated over and the plate blisters and tears out in burnishing or buffing, and requires stripping, refinishing and replating.

That is what happens when you do not remove the anodes and clean them. Now if you do not take them out, the action of the solution when they are lifted from the tank, rinses the dirt off and you get it anyway.

In the old days, when it was necessary to use any kind of silver which could be obtained, I understand it was the practice of some platers to hang a cloth curtain in front of the anodes to keep the dirt from floating over the work; and while it would accomplish this purpose, it was still necessary to wash the anodes, and in addition, the curtains needed washing, and the removal of the anodes and the curtains agitated the solution and rinsed off the dirt. As you can see, these troubles would not have arisen had the entire anode been soluble in the solution, as all of this residue must have been present in the anode when it was put into your silver solution. The action of the cyanide solution, took out the pure silver in the anode and left the black residue because the cyanide was not a solvent for it.

We had customers who bought the regular thousand ounce commercial silver bars, brought them to a low red heat in a forge fire, put them under a drop hammer and flattened them to a point where they would enter their rolls. Others melted these bars, poured the silver into flat, shallow molds, thin enough to enter their rolls, and from this point, with suitable annealing, rolled them to the right gauge and width and cut them to suitable lengths for anodes. We had other customers who bought what are known as "Government Assay Bars", which are cast in a mold that turns out a bar thin enough to be rolled without remelting. These customers used these bars feeling confident that silver bearing the stamp of the United States was the very best that could be obtained. As a matter of fact, the Government stamp on a bar of silver simply means that the melt from which that bar was poured was assayed and the fineness is stamped on it as a result of such assaying. These bars may or may not contain insoluble matter and are, therefore, we think, not the best silver for the purpose.

The point of view of the Mints and Assay Office is entirely a different one from our own. Our object is to establish a standard for anode silver and uniformly to maintain that quality; while the Government, in refining the silver, simply uses it as a carrier for the gold. The proportion of silver in the doré which the Government requires in the process of gold refining used by them, is so high that the immense amount of gold turned out by them requires a far greater quantity of silver; and this silver is furnished the Government absolutely free and they are paid to use it. You take in gold and silver bars to be refined, they return you the silver you did not want, pay for the gold which they do want and charge you for the refining. You can readily see the only interest the Government has in the silver is to use it as an aid to their gold refining and to so carefully part the bars as to leave the silver free from gold and be able to turn it out 999 fine.

There are two branches of industry using silver which should have the purest which can be obtained to get the best results. One, the electroplaters, and the other the manufacturers of silver nitrate; and while at present, the electroplaters use the larger amount, the recent popularity of the moving picture show, the almost universal use of the picture postal-card (I speak of the sensitized kind) and the coming among us in such large numbers of the amateur photographer, make the consumption of silver in the manufacture of silver nitrate much larger than is generally known.

Notwithstanding the fact that silver plating was being done commercially over sixty years ago, there was no concern manufacturing and marketing silver anodes as a commercial article until we originated the idea, and so far as I know, we made the first silver anodes for sale as such at our plant which was then located in Chicago.

In talking with a plater, who at the time was engaged in washing off his anodes and skimming his solution, we asked if it would not be a good thing if an anode could be made which would always work clean and white and guaranteed by the manufacturer to be uniform from lot to lot. From the encouragement received at this time, we commenced experimenting, and after numberless discouragements and expensive experiments, we succeeded in 1903 after we had moved our plant to Bridgeport, Conn. Since then we have made and sold tons of anodes, every ounce of which we could thoroughly guarantee.

The silver requires very careful selection to start with and careful handling all through the process. There is very little silver ore that is mined and smelted as such, the value per ton not commercially warranting the operation. There are exceptions to this, of course, the most noted ones being the mines located in the Cobalt district. In many of these, the total cost per ounce for mining, smelting and marketing is from 12 to 25 cents per ounce. The present level of the silver market (at around 60 cents per ounce) permits the operation of these mines at quite a fair profit.

The bulk of the silver we get (I think I may safely say nearly 85 per-cent) is produced as a result of the mining and smelting of lead, and other ores and may, consequently, be termed a "by-product". The aim of the smelters of lead and copper, is, naturally, to produce these metals as pure as possible, so that the silver is left behind in the slimes with impurities. Naturally as the ores vary a great deal in impurities, depending upon the locality in which they are mined, so also the impurities accompanying the silver will vary, and while some silver is suitable for anode purposes, others, owing to the excessive cost of a suitable refining, are prohibited, while others cannot be used at all. Our success depends upon our being able to select the right kinds and rejecting the wrong kinds; in fact, in knowing how.

We are glad to feel from the reception our anodes have had, that our efforts have not been wasted, and that an anode which can always be depended upon to work clean and white from beginning to end, and from lot to lot be absolutely uniform, is appreciated.

Correspondence.

Production of Cadmium in the United States.

Editor:

On page 51 of the February issue of THE BRASS WORLD, the statement is made that no cadmium is produced in this country except at one zinc smelter where it is recovered as a by-product in zinc smelting.

This statement was true of conditions in 1910, but at present, cadmium is being recovered by two companies in The United States, one of them a lead smelter as you will note by referring to page 49 of the advance pamphlet *Zinc and Cadmium in 1910* of the Mineral Resources of the United States:

"The American Smelting & Refining Co. began the production of cadmium in 1910 by the recovery of a few hundred pounds at the Globe smelter in Denver, Colo. It is reported in the mining press that the cadmium is recovered from flue dust.—No details of the methods employed for recovering the cadmium at the Globe smelter have been made public. It is reported that furnaces are under construction which will have an output of about 1000 lbs. of cadmium per month.—It seems likely that the source of the metal lies in the zinciferous lead ores from Leadville, Colorado and similar ores.—In 1908, W. R. Ingalls stated that noteworthy quantities of cadmium occur in the "fume" from lead smelting furnaces, and that the utilization of this material as a source of cadmium had been considered, though negatived on account of lack of market for the metal."

Hoping this may be of interest to you, I am

Very respectfully,

C. E. Siebenthal, Geologist.

United States Geological Survey.

Washington, D. C. Feb. 24, 1912.

Rolling mills which manufacture nickel alloys, have found manganese of great assistance in obtaining malleable metal. It is now extensively used in producing sound nickel alloy castings, and has made it possible to roll nickel alloys previously considered exceptionally refractory. It is the natural deoxidizer for nickel and its alloys as it removes both oxygen and sulphur.

A New Pyrometer with an Illuminated Scale for Use at Night or in Dark Locations.

The Brown Instrument Company of Philadelphia are adding to their very complete line of electrical pyrometers, a new illuminated dial indicator, with exceptionally long scale. Frequently an instrument is desired which can be easily read by the operator of the furnace or kiln, at some distance, and the new "Brown Pyrometer" with illuminated dial is particularly desirable for just such conditions.

Fig. 1. Brown Pyrometer with Illuminated Dial. Showing the Front of the Instrument.

This new instrument with extra long scale 12″ can be furnished with or without illuminated dial as desired. Where the illumination is sufficient, the instrument does

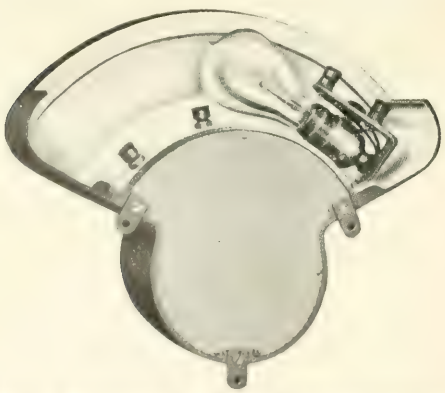


Fig. 2. Back View of the Brown Pyrometer, Showing Method of Lighting.

not require an illuminated dial, but the long scale affords very open graduations, and accurate readings.

In many plants, however, such as dark shops for hardening and heat treating steel, and where work is carried on day and night, the illuminated dial instrument is preferable. The scale is drawn on opaque glass, and a 16 candle power lamp placed behind the scale, makes the graduations and the pointer stand out clearly at a distance. The operator using the instrument appreciates the advantages of such an instrument, and better results are secured through the ability to secure more accurate readings of the temperature.

New Books.

HAND FORGING and WROUGHT IRON ORNAMENTAL WORK, by Thomas F. Googerty, Instructor of Forge Work at Stout Institute. The constantly increasing popularity of Art-Craft Ironwork, together with the demand for an inexpensive handbook on the subject have prompted the publication of this volume. While it deals largely with interior ironwork, it shows also the constructive side of ornamental hand-forging and points out the guiding principles and methods which underlie all forge work. Some of the chapters are on: The Spirit of Decorating—Correct Principle in Designing—Equipment—How to Draw the Iron—Various forms of Welding—Brazing — Scroll Work — Grilles — Embossing — Forms in Relief—Drawer Pulls and Hinges—Door Plates—Iron Lamps—Special Designs—Twisting etc. The book is published by the *Popular Mechanics Co., Chicago, Ill. 208 pages, 122 illustrations, 5½ x 8 inches. Bound in cloth. Price, postage paid, $1.00.*

THE KINGDOM OF DUST, by J. Gordon Ogden, Ph. D., Professor of Physics and Chemistry, Fifth Ave. High School, Pittsburgh, Pa. This interesting little book is written in a popular vein and the good and bad features of dust of every description are described. Beyond the popular side of the book, there is the scientific aspect and one of the chapters is entitled "The Foe of the Workman." It is this chapter that is of interest to manufacturers as the effect of dust upon men working in the various trades is given. Statistics about the mortality of the various trades with other data showing the bad effect of dust are also given. The book is published by the *Popular Mechanics Co., Chicago, Ill. 128 pages, 10 illustrations. Cloth bound. 5 x 7 inches. Price, postage paid, 50 cents.*

An Improvement in Electrotyping.

An improvement in electrotyping has been patented by Francis J. McElhone of Jersey City, N. J. It consists of mixing pyrogallic acid with the graphite used in the regular electrotyping process. The process is carried out as follows:

A mixture of 200 grains of pyrogallic acid in 1 gallon of water is first made. In this solution, 8 lbs. of electrotypers' graphite are stirred until it becomes wet and pasty. The graphite is then filtered out, washed and dried. It is then used for coating the wax matrix in the regular manner employed in electrotyping.

It is claimed that the treatment of the graphite with pyrogallic acid renders it more conductive and there is less tendency to form bubbles on the surface with the resulting pinholes in the electrotype.

Bronze plating is always carried out in a solution containing copper and zinc and tin is rarely used in place of the zinc. A satisfactary color can be obtained by copper and zinc, and is easier to work than copper and tin baths. The zinc is also cheaper than tin.

The Life of Graphite Crucibles in Oil Furnaces.

It has always been assumed by brass founders that the life of a graphite crucible in an oil furnace is much less than it is in a coke or coal furnace. At one time, it was supposed to be the poor quality of the crucible itself, but brass founders have now learned that the manipulation of the furnace itself is usually the cause of short lived crucibles and that the maintenance of a non-oxidizing flame, (either a neutral or a reducing flame) will result in obtaining a satisfactory number of heats.

An oxidizing flame is very easily obtained in oil furnaces, in fact, it is too easly produced and furnacemen are very apt to melt with it.

Fig. 1. Graphite Crucibles Which Ran a Large Number of Heats in an Oil Furnace.

When used, not only does it bring the melt loss of the metal up to an abnormal amount, but it burns the graphite from the surface of the crucible, shortening its life by a large number of heats. By maintaining a neutral or reducing flame, both of these difficulties are overcome to a marked degree.

That the use of this neutral oil flame results in a longer life in the crucible, is evidenced by the accompanying illustrations of crucibles which have been used from 50 to 68 heats. These photographs were supplied us by the Anthony Company, 9 Jackson Ave., Long Island City, N. Y., the well known makers of oil furnaces. The crucibles were used in their

oil furnaces in melting brass and by means of their special burner a neutral flame is obtained which brings the life of the crucible up to the maximum degree, even greater than can be ob-

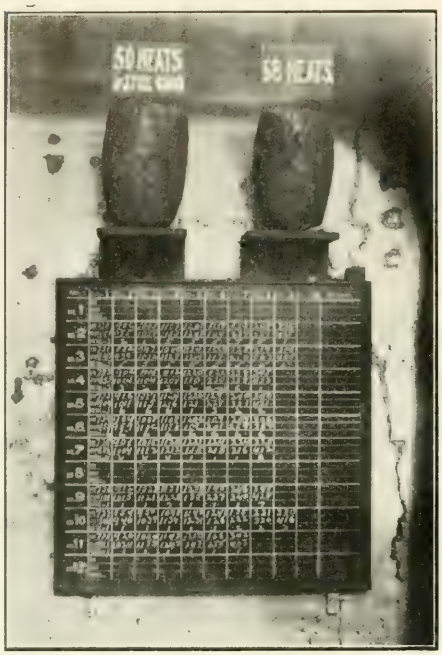


Fig. 2. Method of Recording the Number of Heats which the Crucibles Ran.

tained in coke or coal furnaces. These crucibles were special No. 70's holding 215 lbs. of brass. The average time of the heat was 1 hour and 3 minutes.

Effect of Electric Current on Cyanide Solutions and a Simple Way for Their Preparation.

By Dr. M. G. Weber.

As cyanide solutions give usually a brighter and denser deposit than acid baths and can be employed in almost every case, whereas acid solutions have but a limited field, they are in use in nearly every plating field.

When one passes an electric current through solutions containing a double cyanide; for instance, double cyanide of copper and sodium, (I mention sodium and not potassium, as sodium cyanide is cheaper and more efficient than the potassium salt) this salt is separated into 2 parts, the cathion (Na) and the anion. If the current density is not too high and the copper salt is present in suitable concentration (about four ounces of metal per gallon), the cathion will act with a reducing effect on the double cyanide of copper and sodium and turn out the copper on the cathode.. We do not see, then, any hydrogen gas developed, but free cyanide of sodium being formed. On the anode an oxidation takes place—the primary anion combines with the anode copper to the single cyanide.

Cuprous cyanide is only soluble in cyanide solution, and the anode becomes covered with a dirty green mud offering quite a resistance to the current, unless free cyanide is present. We understand, therefore, that the cyanide being formed at the cathode is absolutely necessary to keep the bath in the proper working condition. In order to bring the free cyanide from the cathode quickly together with cuprous cyanide on the anode, it is of advantage to stir the solution and also to heat it up, as in this way, the diffusion will be considerably increased.

In case the current density on the cathode is too high, which can be perceived from an intense bubbling up of gas, the sodium no longer acts with a reducing effect, but is discharged and forms with the water of the bath sodium hydrate and hydrogen. The free cyanide is, therefore, lost, and this is the reason why cuprous cyanide on the anode cannot be entirely dissolved; a sludge will remain dropping to the bottom of the tank. In order to bring this mud in solution, as is necessary to prevent the electrolyte from becoming impoverished in metal, sodium cyanide should be added. By using too high a current density on the anode, molecular cupric cyanide is set free, which combines with water to basic cupric cyanide, forming a green mud. Hydrocyanic acid is also formed. This hydrocyanic acid becomes polymerized and forms an insulating, cocoa colored film, which adheres to the anode. The addition of cyanide will bring this compound into solution.

In order to facilitate the dissolving of the anode metal and the secondary deposition at the cathode, we add so called conducting salts

*Abstract of a paper read at a banquet of the National Electroplaters' Association, held in New York City, Feb. 10, 1912.

†Works Manager, the Roessler & Hasslacher Chemical Co., Perth Amboy, N. J.

to the bath. If sodium sulphate, for instance, is used, the cathion sodium decomposes the copper sodium cyanide, copper being deposited and simultaneously sodium cyanide is formed. The anion acts on the double cyanide in a known manner and cupric cyanide will result, which dissolves the anode metal.

It is interesting to note the conditions of voltage and current density, which are required for cyanide solutions; for example, we take the copper cyanide solution again. The ordinary voltage for a solution of this kind in a cold stage ranges between three and five volts. If, however, we use a hot bath, say from 170 to 180° F. in connection with a moderate current density and agitate it well, we need no more than one volt. The current density for cold solution is about three to four amperes per square foot, whereas using hot, well stirred electrolyte, we are able to go up to 20 amperes and still obtain a first class deposit.

The preparation of cyanide baths according to older recipes, as for example that of Roseleur, is rather complicated. The chemicals must be pure and must be mixed carefully, in definite proportions and in a certain order of succession. It is difficult to be sure of the purity of the chemicals, and we all know how easy it is to make mistakes in weighing and mixing. Furthermore, one has to bear in mind that much time is lost in making the solution ready for use, especially for gold and silver plating where most people start with the metal. The fumes given off in the preparation of solutions are disagreeable and dangerous.

All these difficulties and troubles are obviated by the use of some new products, which are sold under the name "Trisalytes". They combine in one salt all the necessary ingredients for plating baths; that is, an alkali cyanide, a cyanide of the metal to be deposited and a conducting salt. The metal contents of these Trisalytes are always constant and, in order to make up a plating bath, it is only necessary to dissolve one of them in water. Voltage, current density and all other conditions remain just the same as in baths prepared after the old method.

By making baths with "Trisalytes," fumes and poisonous gases are avoided, also there is absolutely no chlorine present which has such a destructive corrosive action on the hooks on which the anode plates are fastened.

The "Trisalyte" baths have a further advantage: that is, a longer life. They contain only the necessary ingredients required for electro-plating, and no unnecessary salts are introduced as for instance when copper or zinc carbonate is first converted into copper and zinc cyanide by the use of alkali cyanide with the formation of soda. It will therefore be easily understood why the baths can be readily revived by the addition of Trisalytes.

With all these advantages, the "Trisalytes" are bound to facilitate, expedite and improve the work of the plater.

Corundum.*

By Walter C. Gold.†

During the last decade there has been a marked increase in the use of corundum for the manufacture of grinding wheels. This is solely due to the discovery of an immense deposit of corundum ore at Combermere, Barry's Bay, Ontario, Canada. This deposit was accidentally found by a resident of that region, Mr. Armstrong, in the year 1900. The whole face of the mountain, which is 20 miles from a railroad station, is literally covered with corundum and its associates. Although the deposit yields but 8 per-cent pure corundum, it is so large (it is an immense "drift") that it pays to mine the mineral; besides, this is the only known deposit of any magnitude on this continent. There is some corundum mined in India from which India oil stones have been manufactured; some in Australia and a little in Montana and Georgia, although the latter mines have been practically abandoned, the supply becoming exhausted. Years ago there was considerable corundum mined at Hilltop, near Asheville, N. C., but these mines, too, were abandoned owing to the cost of the mining becoming too great. Some very fair grinding wheels were made years ago from this North Carolina and Georgia corundum, which is usually found in a belt of serpentine in altered olivine rock; has gneiss for an immediate associate and in the

*From the American Journal of Pharmacy, Feb. 1912.

†Philadelphia, Pa.

decomposed rock are found the veins or beds of corundum. The principal associates of Canadian corundum are spar, iron, pyrites and mica. But the discovery of the Canadian mine effectually suppressed the operation of the Southern mines. The finest corundum ever produced came from Unionville, Chester County, Pa. Here the ore was of the blue sapphire variety and, here too, were found the only *true* loose crystals—pure crystalline corundum, six sided and free from impurities. The writer possesses four of these crystals which weigh an average of two pounds, as follows:

No. 1 .. 1 lb. 9 ozs.; size, 1½" x 3 "
No. 2 .. 1 lb. 13 ozs.; size, 2½" x 2¾"
No. 3 .. 1 lb. 9 ozs.; size, 2 " x 3¼"
No. 4 .. 3 lbs.; size, 4 " x 3 "

These mines were worked until 1893 and then abandoned, as the corundum was found in "pockets" only. It was believed that if a tunnel was dug through the property where surface indications seemed to warrant such action, that a large deposit or lead would be encountered. Unfortunately, nothing but the associates of corundum were found and after this costly experience, the mines were abandoned permanently. Throughout the section surrounding Unionville, surface pieces of the sapphire variety are frequently found and if a good "lead" could be located it certainly would prove a bonanza, as this Chester County ore produced the best grinding wheels of their type yet supplied the trade.

There are a number of varieties of corundum: Sapphire, pink, cream and the white. The quality depends solely upon the percentage of alumina or oxide of aluminum. The Canadium corundum, when perfectly cleaned, contains about 95 per cent. alumina. The Southern corundum only contains about 75 per cent. alumina on the average. The specific gravity is 3.95 to 4.050. Pure corundum is number 9 in the scale of hardness, the diamond being rated as 10.

All the Canadian corundum is washed after being crushed by great chill rolls. The crushed ore is then run over a "watertable," across the surface of which it passes by specific gravity; the corundum being heavier than its associates, drops first from the "table." The corundum is then passed through a long cylindrical drier and from there it moves to the sieves or screens made from bolting cloth; and from these screens it is packed into bags of one hundred pounds, the number of the corundum being determined by the mesh or number of holes to the square inch of cloth.

The principal numbers are as follows: 6, 8, 10, 12, 16, 24, 30, 40, 46, 54, 60, 70, 80, 90, 100, 120, 140, 150, 160, 180, F, FF, FFF, FFFF. The first eleven numbers are what are termed "coarse grain," the second nine are the "fine grain," and the last four are "flours."

As before noted, the corundum is washed with water and then "concentrated" through the use of a concentrator to remove the micaceous associates and other foreign matter. Corundum so treated of course costs more to produce, but this treatment results in a pure article—one which will cut more keenly and prove more durable than otherwise. Unless the corundum used in the manufacture of grinding wheels be *pure,* they are apt to crack, owing to the presence of foreign matter which "fluxes" into the kiln, the vitrified wheels being exposed to about 2500 degrees F. After the corundum has been graded in numbers it is then run over a magnetic separator and the iron (about 4½ per cent.) is removed by this machine.

Much improvement has taken place in the manufacture of corundum in recent years, the principal innovation being the "concentrating" machine, through the use of which the corundum is "mulled." This process also removes the micaceous associates and relieves the corundum of low-grade ore.

The consumption of corundum in this country, for both grinding wheels and polishing purposes, is about 1,000,000 pounds per year. And the demand, which is principally for the manufacture of grinding wheels, is really greater than the supply.

The advantage in the use of corundum over emery for grinding purposes is that corundum is harder and sharper (it will be quickly perceived by the use of a magnifying glass in the examination of the grains) but it has additionally a better "fracture" and, incorporated into grinding wheels, it is far superior to emery in rapidity of cut and durability. It successfully competes with two artificial abrasives: Alundum (electrically treated Bauxite) and Carborundum (carbide of silicon).

The duty on Canadian corundum, which was one cent per pound, has been removed and it is, therefore, duty free. While, as previously

stated, the amount of corundum mined is largely used in the making of grinding wheels, it sells to the trade for polishing or grinding purposes for from 10 to 15 cents per pound, the price depending upon the grain desired as well as the quantity purchased at one time. Thus it will be observed that it is a commodity commanding a good price, considering the fact that but 8 per-cent of the ore mined results in commercial corundum.

Brass and Bronze Plating Solutions and How to Make Them.*

Third Paper.†

The Cyanide.

Brass or bronze plating solutions are always made by dissolving some compound of copper and zinc in cyanide. The compounds, as previously stated in the Second Paper, are usually the carbonates of these metals as they have been found most satisfactory. For dissolving them, a cyanide is used and either potassium cyanide, the double cyanide of potassium and sodium, or sodium cyanide may be employed. Sodium cyanide, however, is fast coming into use for the reason that a less quantity is required to dissolve a given weight of carbonates, and hence is cheaper; and also because it gives less spotting-out trouble. This will subsequently be explained.

The value of any sample of cyanide, either the straight potassium cyanide, the double potassium and sodium cyanides, or the sodium cyanide, depends upon the amount of available cyanogen that is contained in it. Strictly speaking, this is all there is to the cyanide question and the more cyanogen a sample of cyanide contains the more it is worth as far as dissolving power is concerned. Cyanide is always tested for value (and this means dissolving power for the copper and zinc carbonates) by the use of a standard solution of silver nitrate. This silver nitrate solution is made as follows:

Dissolve 16.998 grams of silver nitrate in 1 litre of water. This is called a *decinormal solution* of silver nitrate. Weigh out 20 grams of the sample of cyanide to be tested and dissolve in 1 liter of water. By means of a 50 c. c. burette, measure off exactly 50 c. c. of this solution. In this 50 c. c., therefore, there is exactly 1 gram of cyanide. Run the solution thus measured into a small flask, and then, from another burette or the first one rinsed out, run in the silver nitrate solution a little at a time with constant shaking. When the silver nitrate is run into the cyanide solution a white precipitate is formed which dissolves on shaking. When the time arrives at which the precipitate does not dissolve, then add no more as the operation is finished. Read off the number of cubic centimeters of the silver nitrate solution that has been used. The amount of silver nitrate solution used will determine the amount of available potassium cyanide in the sample of cyanide or, as it is frequently called the *potassium cyanide* equivalent. It makes no difference whether the sample tested is the straight potassium cyanide, the double potassium and sodium cyanide, or the sodium cyanide, it is always considered in *potassium cyanide equivalent,* or, in other words, is calculated as potassium cyanide although it may all be sodium cyanide. This has become a custom in the trade. It explains why, in the case of sodium cyanide, the term 129-130 per cent is used. It means that the sodium cyanide is equivalent to this amount of potassium cyanide, or that 100 lbs. of sodium cyanide are equal to from 129 to 130 lbs. of potassium cyanide.

By reading off the number of cubic centimeters of the silver nitrate solution used in testing the sample of cyanide, the percentage of potassium cyanide (potassium cyanide equivalent) in it can be obtained. *One cubic centimeter of the silver nitrate solution equals 0.01302 grams of potassium cyanide.* Therefore, if 75.3 cubic centimeters were used, then the sample of cyanide is 98 per-cent potassium cyanide equivalent. In this manner the true value of the cyanide may be obtained.

It has never been proved that there is anything beyond the potassium cyanide equivalent in cyanide that determines its value for brass or bronze plating, when the actual plating is concerned. If two samples of cyanide show the same potassium cyanide equivalent when tested, then they will be found of equal value. If one shows a greater amount, then it is worth more. Platers have always been apt to

*Continued from THE BRASS WORLD, February, 1912, page 49.

†These papers will be continued for a number of months.

believe that there is something mysterious in the matter of cyanide although one sample may test the same as another, and have been accustomed to purchase on name rather than test. This belief has never been substantiated by facts, and so far there has never been any result obtained that proved that there is anything to the cyanide question other than the amount of cyanogen contained in it (the potassium cyanide equivalent).

In the case of spotting-out, the matter is different and sodium cyanide is to be preferred when this obstacle is encountered. In this instance the question is not one of plating, but of *final* properties of the cyanide. Spotting-out is caused by the plating solution in the pores of the casting working out after finishing. If the solution is made of potassium cyanide, then, as it works out, it absorbs moisture (being deliquescent) and liquefying, gradually spreads over the surface and produces a large spot. If the solution is composed of sodium cyanide which is not deliquescent, then the solution, oozing out from the pores of the plated surface, dries up instead of liquefies and the spotting out is, therefore, greatly lessened. In brass and bronze plating, therefore, the use of sodium cyanide is particularly recommended for plating cast-iron or malleable-iron castings that show the difficulty of spotting-out when plated.

The Disintegration or "Decay" of Metallic Tin.*

O. L. Erdmann drew, in 1851, the attention of the Königlich Sächsische Gesellschaft der Wissenschaften, to a peculiar alteration in the structure of some organ pipes which he had observed in the castle church in the village of Zeitz. The decay was attributed, at that time, to the concussions to which the pipes had been exposed. The observation was not heeded for some years, until Fritzsche, in St. Petersburg once more called attention to this peculiarity. Since our observations, to a large extent, are in perfect accord with those of the Russian scientist, his account will be quoted:

"The chief of a commercial firm informed me in 1868, that many blocks of Banca-tin, belonging to the same consignment, had decayed in the store of the custom house. I remembered dimly that some years previous a large number of cast tin-buttons for military

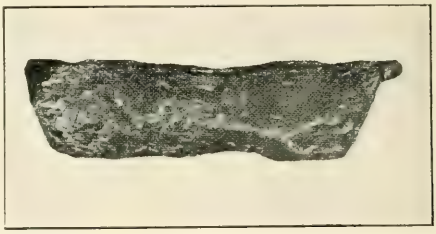


Fig. 1. Pig of Tin Which Disintegrated on Account of Having been Exposed to a Very Low Temperature.

uniforms which had been kept in one of the Crown magazines, had been found to have decayed into a shapeless mass when inspection took place, and that an inquiry into the cause had been opened at that time. I did not know whether this inquiry had any results. I, therefore, at once examined a new case of tin decay at the spot and ascertained that, while a certain number of blocks had com-

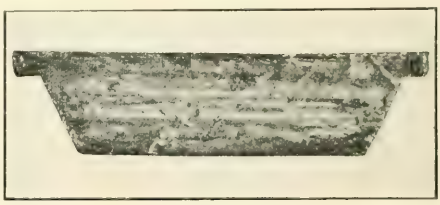


Fig. 2. Pig of Tin Showing Normal Conditions.

pletely preserved their normal appearance, others had suffered a profound change in their structure.

From the very first, I had the opinion that the cause of the change in structure was the exceptionally low temperature of the winter 1867-1868 at St. Petersburg (on January 26th. the thermometer had gone down to 36 degrees below zero-Fahrenheit). I, therefore, in May 1869 submitted tin to artifically produced low temperature below the freezing point of mercury, and I had the satisfaction to observe that tin, at this low temperature, soon underwent a change in structure entirely corresponding with that found in Feb. 1868. In-

* Abstract of an article on the "Allotropy of Metals" by Ernst Cohen, Professor of Physical Chemistry at the University of Utrecht, and published in *The Transactions of the Faraday Society*, November, 1911.

quiries also acquainted me with other additional circumstances. Thus another firm informed me that another portion of Banca-tin had suffered in the same way during the winter 1867-1868 and that this decay of tin at extreme cold was well known in his establishment, especially to the men employed in tin

Fig. 3. Obverse Side of a Tin Medal, Showing the Spots of the "Tin-Pest" or Decay.

stores. They had, indeed, a special name for this tin, a Russian word, which might be translated: "Tin That Can Be Scattered About". The chief of a Russian drug house, whom I met here, told me that he had himself seen the decay of Banca-tin several times during very cold weather in the winter fair at Irbit; the tin would swell and develop warts and drops which would adhere to a copper wire, as if they consisted of mercury. This he considered an incontestable proof that Banca-tin contained mercury.

After this historical introduction, I pass to a description of the special condition in which I found the altered tin. Whilst, as I stated already, some blocks had remained entirely unchanged, others had undergone a more or less radical alteration. These latter blocks had assumed a brittle consistency. Isolated spots at the surface with warty swellings were at once recognizable, or swellings extending from a larger portion of the surface which still retained some cohesion, more or less deeply into the interior. Other blocks had lost their metallic lustre completely; they either looked dull, of a radical, fibrous texture throughout their mass, or the surface had alone turned crystalline, while the interior had retained its metallic appearance. A saw-cut displayed these differences at once. The completely changed blocks had partly turned into a grainy, powdered mass, like sand; other portions formed lumps of various dimensions up to the size of the fist, of loose cohesion and fibrous texture. In the specimens that had been exposed to artificial cold, the effect of the cold had apparently started from certain spots and spread under development of a warty extumescence of a coarse, fibrous texture. The appearance suggest a rough, mosaic structure and could be separated at the fissures.

The color of this modified tin is decidedly gray, and distinctly different from the ordinary bright metal. When the tin is heated, this color undergoes a very striking change. When hot water is poured over it, the dark gray becomes much lighter, almost like that of ordinary tin. It is immaterial whether dry or

Fig. 4. Reverse Side of the Tin Medal. Made in 1692.

wet is applied, and neither the water or the aqueous vapor takes any part in the color change. When a glass stoppered bottle, filled with sandy, dark-gray tin, was heated on a water bath until the color became lighter, I noticed not an inconsiderable diminution in volume. I then exposed this tin to the temperature below the freezing point of mercury, with the curious result that the color became dark again. The sandy mass would not run out of the bottle and had apparently increased

in volume again so that the grains pressed against one another which impeded their gliding over each other.

When the gray tin is heated up to melting, a certain portion of it remains behind in an oxidized state. This again, is a consequence of its broken up structure. The fused tin regains on cooling entirely the appearance of ordinary tin, and when exposed to a low temperature, it undergoes the same changes as before, provided it has not been contaminated with other metals."

Fig. 5. Tin Coffee-Pot Which Shows the "Tin-Pest" or Decay.

The author makes the following remarks in regard to his own observation on the decay of pig tin. He says: "I have here (Fig. 1) a block of Banca-tin, originally 35 kilos in weight, which shows the first described phenomenon in a marked degree, especially when compared with an unchanged block (Fig. 2). The corroded block had been returned by a Moscow firm to Rotterdam because an adulteration was suspected. The tin has turned gray by the kilogram, and the powder is still dropping from the block. I wish to emphasize that analyses prove that the tin is very pure; it does not contain more than 0.05% impurities."

"A long time ago an antique dish was found near Appleshaw, in Hampshire. It is now in the British Museum. The composition by analysis is: Tin, 94.35%; Lead, 5.06%; Traces of copper, oxygen, carbonic acid; and loss 0.59%. The extraordinary molecular change which the metal has undergone is of more interest to the physicist and metallurgist than to the antiquary. The metal is not much oxidized, yet it is so exceedingly brittle that it can be broken with the fingers. The effect of time has resulted in a complete alteration of the molecular structure, the mass of the alloy being converted into an agglomeration of crystals, and to this the brittleness is due. On melting and casting a small fragment I found that the crystalline structure disappeared and the metal regained its original toughness. The vase dated from 350 B. C. and had probably been lying in Hampshire for about 22 centuries. The mean annual temperature of this locality, I am informed, lies below 18° C."

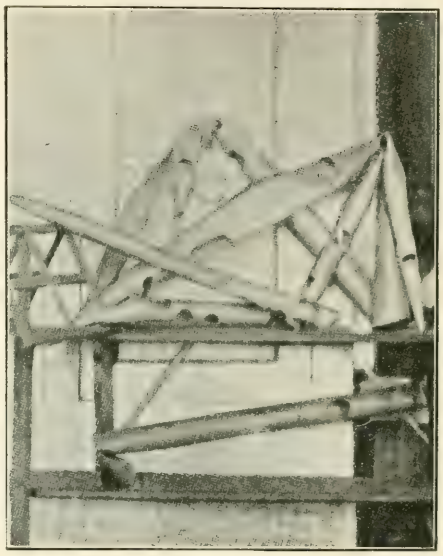


Fig. 6. Tin Organ Pipes from a Church in Ohlau, Silesia, Which Show the Decay.

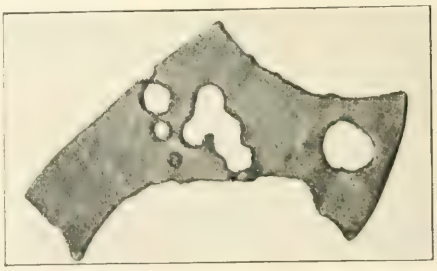


Fig. 7. Holes in the Tin Organ Pipes Shown in Fig. 6.

"I applied to several directors of museums in Holland and other countries for information in regard to the decay of tin. They confirmed the statement without being able to supply specimens. A few years ago, I obtained possession of the tin medal shown in Figs. 3 and 4. It will be noticed that it is badly affected by the "tin-pest" on both sides. The warts of gray tin have reached a height of several millimeters. The medal was cast about 1692 by the Leiden medal maker, Johannes Smeltzing, and the disease has thus had two centuries to develop."

"We are thus confronted with a *museum disease* of universal occurrence which can only be prevented by maintaining the temperature of the rooms above 18° C. In winter, the rooms will have to be heated. Visits to the stores of dealers in antiques have entirely confirmed my views. Many of the tin objects found there are more or less affected with the disease. In the coffee-pot shown in Fig. 5 holes have developed which penetrate to the interior. That our church organs are badly subject to the "tin-pest" may be imagined. The organ pipes which are illustrated in Fig. 6 come from the village of Ohlau, in Silesia. The church had been partly restored in 1833. In 1884, twenty-four pipes were found decayed. Fig. 7 shows the holes in these pipes. In Fig. 8 a part of the roof of the town-hall at Rothenburg-a-T. in Germany is illustrated.

"Organ builders have so far not risked to utilize the material of old pipes for the manufacture of new pipes. The old pipes need only to be melted down under an addition of coal to regain white tin good for new pipes. If the deterioration of church-organ pipes is to be prevented, the temperature will have to be kept above 18° C."

"You see that our scientific researches on the transformation of tin have taken us over into the domain of technics. I could add several more examples of technical interest, bearing on other technical problems with which I have become acquainted within the last few months. As I am not permitted to publish details, however, I will refer to a point of historical interest: In the work of Aristotle, the following passage occurs. Translated, it reads:

"'They say that the Celtic tin melts much more easily than lead. A proof for the fusibility is that it melts, even in water. It is, apparently, very sensitive to exterior influence. It melts also in the cold, when there is frost, because, it is said, the warmth which is in the tin is imprisoned in the interior and compressed, owing to its weakness.'"

"'You see, gentlemen,' said the author, 'there is nothing new under the sun.'"

The author carried out a series of investigations in order to reproduce the decay of the tin in an artificial manner and was not only able to cause the change from white to gray tin by maintaining at a low temperature, but found that the white tin could actually become *infected* by coming in contact with the germs of the diseased tin or gray powder. The

Fig. 8. Tin from Roof of the Town-Hall in Rothenberg, Germany, Which Was Subject to the Decay.

whole was kept at 5 degrees below zero Centigrade for several weeks and developed the difficulty. To this disease, he has applied the name of *tin-pest* and assumes that the gray tin is simply an *allotropic* form of tin or, in other words, it is tin in another physical condition just as the diamond is another form of charcoal.

Cheap clocks are manufactured at two Russian factories in Warsaw, but the high grade articles are imported, chiefly from Switzerland, Germany, France, Austria and Italy, although the United States has acquired a small part of the trade. The masses in Russia still look upon a clock as a luxury and a watch as an ornament. The alarm clock, however, has met with a more ready sale among workmen who have found it a necessity. The Warsaw factories supply the demand for these clocks.

Galvanizing.*

By Louis Potthoff.†

The coating of iron or steel by dipping into a bath of molten zinc and called "Galvanizing" is far from being a satisfactory process. Such articles as fine tools, springs, screws, wire gauze and similar things cannot be given a coating of zinc by the hot process. It is limited to a class of articles, the usefulness of which would not be destroyed, or at least affected by the heat necessary to melt the zinc, or by the uneven coating of the metal. Neither is it a reliable protection from rust or oxidation. The coating is of a porous and granular nature and instead of acting as a preventative of rust really helps the corrosion to become more rapid through the electro chemical action which is caused by the moisture of the atmosphere and the chemicals used. The use of ammonium chloride and the chloride of zinc is unavoidable and the combined salts cause the coating to corrode, in case of mechanical injury, from the inside to the outside notwithstanding the thickness of the coating given. All threaded material has to be recut, the zinc removed and practically left without any coating; if the material has to be stamped or bent the zinc coat will peel or crack, threads on pipes are cut after same have been galvanized and the bare iron on the threads is exposed having no protection whatever. Therefore, the thread of the pipe is anyhow the weakest part, if this is left unprotected the whole pipe may as well be used without galvanizing as far as the protection against rusting is considered, because if the threads are gone the pipe is useless.

Within the past five years increased attention has been given to cold zincing or electrolytic galvanizing. This is not a new process, as it had been in successful use a long time previously coating all kinds of iron castings, tubes, wire sheets, etc. More particularly, however, has attention been given to this special branch of industry in Germany, Italy, England, Austria and Hungary. In the last named country the researches of Czermay have attracted considerable interest. In government yards, various shipbuilding establishments, tube and wire works the results obtained have been so economical and gratifying to the users that hot galvanizing has been suspended.

The results that have been accomplished by

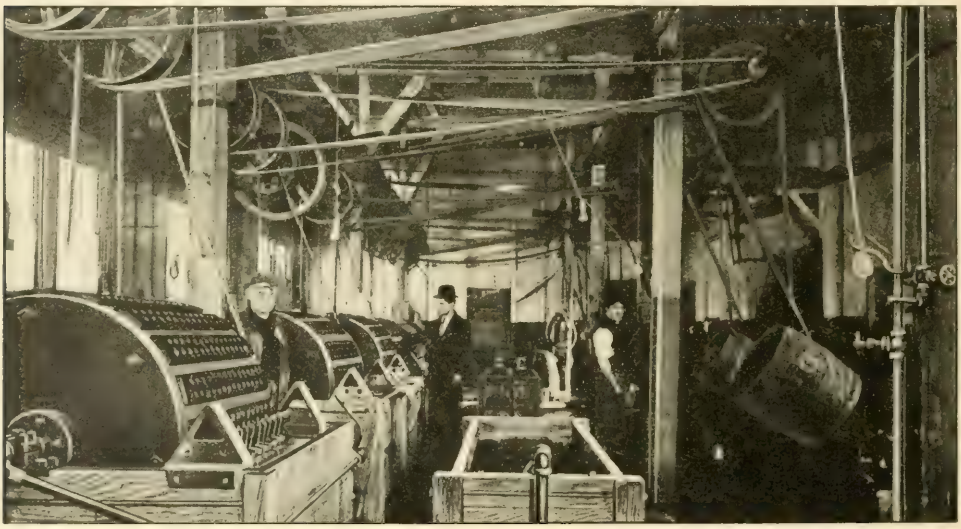


Fig. 1. Plant Installed for Galvanizing Nails and Roofing Caps at Works of F. W. Bird & Son, East Walpole, Mass.

*A paper read at the Banquet of the National Electroplaters' Association, held in New York City, Feb. 10, 1912.

†President, The U. S. Electrogalvanizing Co., No. 1 Park Ave., Brooklyn, N.Y.

Czermay on the theory of neutral baths have been amply confirmed by the splendid work accomplished by Prof. C. F. Burgess of our own country. They demonstrate that on the one hand electrolytic zincing resists atmospheric and other corroding influences much better than hot galvanizing, while on the other hand the cold process dispenses with dross and further avoids the inevitable loss of pots and metal.

In order to convince parties who were more or less interested in this process, severe tests were made for lengthy periods on pieces of various articles coated by the cold process such as wide variations of temperature, carbonic acid, sulphurous acid and humidity. To make these tests conclusive an atmosphere

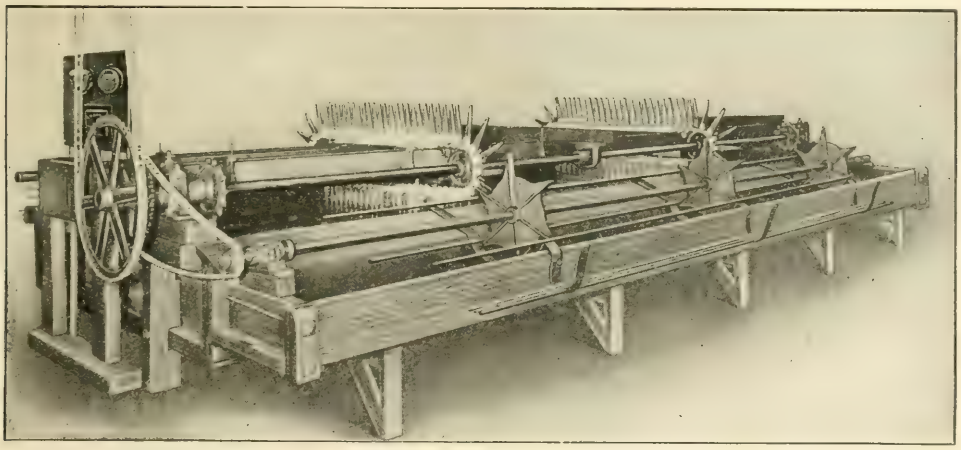


Fig. 2. Bar-Iron and Iron-Pipe Tank Installed at Works of the Safety Armorite Conduit Co. for Electrogalvanizing Conduit Pipes.

containing 15 per cent of carbonic acid and 12 per cent of sulphurous acid was artificially created, while the greatest proportion of these acids in the ordinary atmosphere does not exceed 0.03 per cent of carbonic acid and 3 per cent of sulphurous acid even under the very worst conditions.

The advantages of the cold process over the hot are many, all of them good, but one which is important, is the economy of the process. There is no consuming of large quantities of fuel or the necessity of having a fire 24 hours a day to keep the metal in a molten state. The cold method is always ready and can be put into action at a moment's notice. It is only necessary to use the ordinary precautions of all electro-depositing baths, that of keeping the solution in good working order by the addition of the prepared chemical baths. Then again much less metal is used. In the coating of articles by the hot process relatively large quantities of zinc are consumed on account of the impurity of zinc, if sufficient protection against rusting shall be obtained. The thickness of the coat cannot be regulated as the material is dipped in the molten metal which takes a certain quantity of zinc, and as stated the operation cannot regulate the coating in some instances as for wire, round iron, etc., the material has been wiped when leaving the bath so that a light coat is applied, the thickness of which is similar to that applied by the cold process; but the result is that such material will rust in very short time, where electrogalvanized material having the same thickness of coat has stood the time test very satisfactorily, as proven by experiments and practical tests, which show that a thin electrolytic deposit of zinc will equally well and even better protect the goods, because of its chemical purity, and that a thin coat applied by the hot process is absolutely unsatisfactory.

Anold Philip in treating upon this phase of electrogalvanizing writes:—"Apparently with zinc coatings obtained by the old fashioned hot galvanizing method the amount of zinc required to protect an iron surface so that it will withstand one minute immersion in the saturated copper sulphate solution of 15 degrees C. is about 0.248 ounce avoidupois per square foot, but owing (especially in the case

of wire) to the irregularity of the thickness of the zinc coating, the amount may become as great as 0.4 ounce per square foot, whilst in the case of electro-deposited zinc as little as 0.166 ounce per square foot of surface will afford the same protective effect. The reason for this difference is possibly due to the fact that greater purity of the coating zinc, where electro-deposited, renders local action, and hence corrosion, smaller in the case with less pure zinc employed in the hot galvanizing method." This proves conclusively that articles coated by electrolytic process are superior to those galvanized by the hot process. The thickness of the coating of zinc by the cold method can be regulated, according to the local market was 280 lbs. The adherence was determined by soldering to the zinc surface, with low melting solder, a copper plug half an inch in diameter. By noting on a spring balance the pull necessary to separate this plug from the iron a measurement of the adherence of the zinc to the iron is made."

The toughness and strength of the coating by the hot process were tested by passing various samples between iron rollers. In some cases the coatings were so brittle as to be cracked off in scales by this treatment, and in other cases the zinc seemed to be pressed into the iron. The electrolytic coating behaved much better than that of the hot process coatings when tested this way.

Fig. 3. Plant Installed at Works of the Babcock & Wilcox Co. for Galvanizing Steel Plates.

requirements and depends upon the length of time the material is allowed to remain in the bath. The coating, furthermore, does not affect the strength, temper or nature of the material galvanized. It is well known that in electro-plating the success of the operation depends on the adherence of the deposit—it is the absolute test of successful electro-deposition of metal. Cold electro-galvanizing meets this requirement and Prof. Chas. F. Burgess found that the adherence of the coating deposited from a zinc sulphate solution was 482 lbs. per square inch, while that of the coating of hot galvanized plates bought in the

The class of work which can be galvanized by the cold method is unlimited, nothing is too small or too delicate, nothing is too large. Fine parts of delicate machinery to large steel girders can be given a uniform coating of pure zinc which will resist corrosion. We will now show you a picture of what can be done, and this will be followed by illustrations of the mechanical devices used in depositing zinc or any other metal.

These devices are patented and manufactured by the developers of the cold electro-galvanizing process—The U. S. Electro Galvanizing Co.

Mechanical devices for electro-plating purposes are fast coming into use. During the past few years great progress has been made in this line. The most important, probably, is the plating and galvanizing barrel.

In this line we have excelled and have developed a device which we feel confident you will say that it is the best machine of its kind upon the market. It has several features peculiar to itself and individual patented contrivances which make its operation as near perfection as can be had. When developing this barrel we tried to get away from the disagreeable necessity of having to remove the barrel from the tank to empty or refill it. We were most successful. You, who have had experience in operating a plating barrel well know what a sloppy job it is, necessitating the wearing of heavy shoes, rubber aprons, etc., to protect yourself.

general practice is to remove them once a month and clean off the deposited metal.

When a sufficient coating of metal is produced a lever is shifted, and the barrel begins to rotate in the opposite direction. When it reaches a certain point an attachment, which controls the door of the barrel, is put into action, and the work is automatically ejected into a washing drum which carries it to the *rinsing tank*. With two or three revolutions the barrel is completely emptied and is ready for another load. You will notice that this door works entirely automatically and there is no screwing or unscrewing of any bolts or lag screws.

In the rinsing tank is fresh clean, running water which is supplied at will. The work being thoroughly rinsed is then delivered, not all at once, but in small lots, to the dryer. A novel feature of this running tank is that,

Fig. 4. Patent Automatic Tank. Capacity, 10,000 to 100,000 Pieces Per Day.

With the mechanical plating barrel shown here in the actual size and in the illustration there are no disagreeable features. Shovel your work in the barrel and when it is finished it is all dry in kegs ready for shipment, no handling of the work, no heavy lifting, etc., the barrel does all your work.

The barrel itself is unique in that it rotates in two directions—in the plating and in the self-emptying direction. When the barrel is running in the plating direction the work comes in contact with patent cathode rods which are so protected that they are only slightly electroplated and yet give a perfect contact. They are easily removed and the

through the use of a special contrivance it reverses its motion when the plating barrel is being emptied and while in this motion does not discharge any of its contents into the dryer until the plating barrel is again run in the plating direction. This gives the advantage of having two operations, going on at one time, each independent of the other, that is, while the rinsing and drying of one batch is going on another lot of work is being plated or galvanised in the plating barrel.

The work being delivered from the rinsing tank to the dryer in small quantities affords ample time for the goods to become quite dry before it is discharged through an aut

matic device into a keg or any suitable receptacle.

This electro-plating device is completeness in itself, three different operations, plating, rinsing, drying, working hand in hand, but each distinct, independent of the other, and all working together in absolute harmony.

The Bar Iron and Tube Tank.

This like the plating barrel is complete in itself, the work going in at one side to be plated and coming out at the other side ready for shipment. It has one added feature, however, and that is that the operation is continuous, it can be carried on 24 hours a day, 30 days a month, 365 days a year without interruption.

In plating rods or pipes a 30 minute run is quite sufficient for a good protective coating. The tank of the size shown in the illustration accommodates 30 rods at a time, and 31 minutes after the first rod has been put into the solution, one is completed every minute. In an ordinary work day 500 pipes or rods ranging from 6 ft. to 30 ft., long and from 1/16" to 3" in diameter can be plated or galvanized.

The special feature of this tank, aside from the patented mechanical devices which keep the work in motion, is the arrangement of the cathode rods. These are placed under the solution and at an angle with the tank. This not only insures perfect connection, but every second the point of contact is being changed so that during the entire operation the cathode rod never touches the same place twice. This eliminates all wire marks, or those of supporting hooks or racks. No wetting of the hands or removing the work to shift the wire is required.

The automatic patented conveyor which propels the rods across the tank can be seen in the illustration—they look like long fingers. They are made of special wood treated so as to preserve them. On the side that touches the rod pieces of insulation are inserted so that the wood itself never comes in contact with the work. The fingers slowly propel the works through the solution, keeping the rods or pipes travelling toward the finishing side, at whatever rate of speed the operator desires, the speed regulating the thickness of the coating. They also keep the rods rolling so that the coating of metal is absolutely uniform.

By putting into operation a patented contrivance the anodes of the tanks can be put out of commission and in their place special anodes which plate the inside of the pipes or conduits are connected up. By this arrangement the inside only of the pipes or conduits can be plated, if so required; it is certainly to be understood that the outside only can be coated also, as well as inside and outside in one operation. They are handled otherwise exactly the same as rods with just as as much ease.

A rinsing and drying apparatus is also connected with this tank, which works automatically, delivering the work ready for shipment.

Ordinary still tanks can be used for electro-galvanizing, but for small work we have devised and patented another labor saving apparatus, as shown in the illustration. A peculiarly constructed chain running by a special arrangement is operated on top of the tank. To this chain can be attached work too large for a plating barrel, or too delicate to stand the rumbling, or what would otherwise be hung upon hooks or racks.

The work is hung in at one end of the tank, travelling through same and taken out at the other end finished; from 10,000 to 100,000 pieces can be plated by this device per day. Larger single pieces are hung on hooks, smaller pieces on racks. Each link of the conveyor chain is provided with a U shaped hook having extensions on both sides for taking up the current, after the material to be plated or galvanized is placed on hooks or racks. One hook or rack is hung on the chain travelling slowly through the other end of tank, as soon as it is far enough advanced another hook or rack is placed in the tank until the tank is filled up entirely, then about every half minute one piece or filled rack is finished and taken out by a boy and replaced by a boy on the starting end.

The output is dependent on length of the tank, each tank can be provided with 1 to 4 conveyors. It can also be arranged that the material is passing, before reaching the plating or galvanizing tank, through a potash and rinsing tank.

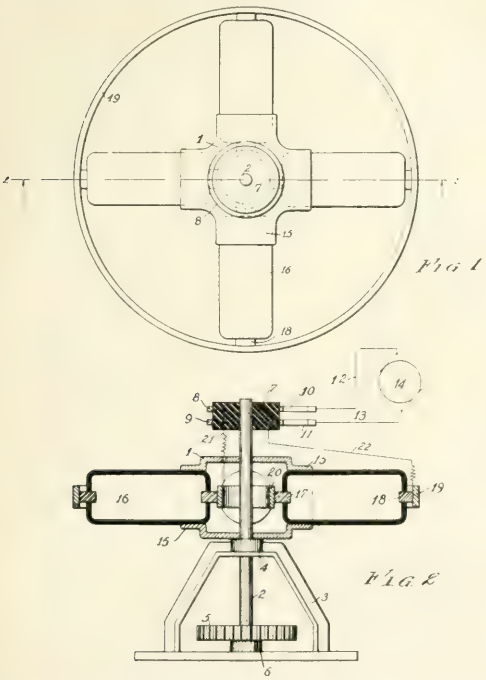
The speed is regulated according to the needs of the work, so that a piece of work starting in at one end may be taken out in 15, 20 or 30 minutes, plated just according to requirements.

It is well known that work which is kept in motion can be electro-plated with a higher voltage without any danger of burning, and

therefore does not have to remain in the solution so long to receive the required deposit. This device keeps the work constantly in motion. Then again work that is kept in motion will not allow the collecting of hydrogen bubbles upon its surface and consequently no pitting of the work results. Pitting of work is unknown in this tank.

A Centrifugal Process for Purifying Aluminum.

A new process for purifying metals, particularly aluminum, has been patented by Charles C. Ruprecht of Cleveland, Ohio. (U. S. Patent, 1,016,097). The molten metal to be purified is placed in the centrifugal machine herewith illustrated and rapidly rotated. This



Apparatus for Separating Dross from Aluminum.

may be accomplished by a motor or belt. The dross and other foreign matter, owing to their different specific gravity, will separate from the metal. If heavier, they will be carried to the outside, and if lighter to the inside.

In the case of aluminum, the dross or oxide is nearly that of the metal. In order to facilitate the separation in such a case, an electric current is passed through the metal in the direction of the exerted centrifugal force. This current, passing from one electrode to another through the molten metal, the inventor states, effectually separates the impurities. The electrodes are made of carbon.

After the metal has been treated by rapidly rotating the apparatus, the impurities will have collected in one end of the chamber, leaving the purified metal in the other end.

A Method of Increasing the Ductility of Metallic Tungsten.

The extent to which metallic tungsten is now used in electric lamps renders any method for improving its quality of much value. Werner Von Bolton of Charlottenburg, Germany, the well known inventor of the tantalum electric lamp, has recently patented a method of increasing the ductility of tungsten so that it can be made into wire for lamp filaments with less difficulty. The tungsten is treated at a red heat with a mixture of hydrogen gas and chloride of sulphur. This serves to remove any oxide of tungsten in the metal which is a cause of brittleness. The oxide is converted into sulphide which is, in turn, decomposed by the hydrogen. The metal thus purified contains some sulphur. It is heated to a white heat in a vacuum furnace to expel it, when pure, metallic tungsten of great ductility is obtained which can be drawn into wire with much ease. When the oxide is reduced by hydrogen in the usual manner, some hydrogen gas is left which causes brittleness. By the sulphur method, this is avoided.

A New Zinc Plating Solution.

A new solution for zinc plating or electrogalvanizing has been patented by Auguste Arsene Lemetre of Paris, France (U. S. Patent, 1,017,981, Feb. 20, 1912). It consists of the following:

Water	1 gallon
Sulphate of Zinc	1 lb.
Sal-Ammoniac	4 oz.
Sulphate of Soda	3 oz.
Sulphuric Acid	2 oz.

The solution is used in the cold condition and the electrogalvanizing is done in the regular manner.

Questions and Answers.

Question No. 1112. What is the best silver-white mixture for making sand castings. We have an order for castings that shall be white and as strong as brass. We have tried to cast German-silver scrap, but have not been successful. We understand that there are some white metal mixtures that are very good.

Answer. The best white-metal mixture for sand casting, and one that is quite cheap, is the following. It is much whiter than German-silver:

Copper	50 lbs.
Zinc	35 lbs.
Nickel	15 lbs.
Aluminum	2 oz.

This mixture casts exceptionally well. It is extensively used for marine hardware (it stands sea-water well) and carriage and automobile hardware.

Question No. 1113. We are troubled with minute, white spots on our silver plated flat-ware. The metal is German-silver and we follow the usual method of plating. The flat-ware is put through the regular cleaning solution, then the quick-dip, next the strike and finally the regular silver plating solution. We scratch-brush the goods, rinse in hot water and dry. After standing, we find thousands of small, white spots on the surface. These are minute, of course, but are more or less conspicuous and injure the goods. We would like to know how we can overcome them.?

Answer. The formation of white-spots on silver plated flat-ware is a more or less common occurrence, and has never been the subject of an investigation. It is our belief that they are caused by minute blisters which hold the plating solution underneath and gradually give it out upon standing. The blisters may be caused by the use of too much free cyanide in your strike or the employment of too strong a current.

Question No. 1114. I have been making aluminum hub caps for automobile use of the following mixture:

Aluminum	82 lbs.
Zinc	15 lbs.
Copper	3 lbs.

This is quite satisfactory as it turns readily on a lathe and takes a good thread. Now what I want to know is, whether this same mixture would be the best for automobile crank cases etc? There are, as you know, large castings.

Answer. You will not find such a mixture very suitable for your crank cases or other large castings. Owing to the zinc it contains, it is liable to crack in the mold and, for this reason, the mixture as follows:

Aluminum	92 lbs.
Copper	8 lbs.

is preferable as it is the best casting aluminum alloy known. It is almost exclusively used for such a purpose.

Question No. 1115. What percentage of silver is there in silver chloride?

Answer. Dry silver chloride contains 75.27% of metallic silver. For practical purposes, it may be called three-quarters.

Question No. 1116. What makes ordinary German-silver run so pasty when cast in sand. We have tried to make German-silver sand castings from scrap German-silver, but find that the metal will hardly run it is so thick. We have tried heating the metal hotter so that the spelter fumes are given off strongly, but even with this the metal does not run well. We have used new metals with a little better results, but even with this new mixture, the metal does not run as it should.

Answer. The cause of the thickening of German-silver when melted is the oxidation of the copper and nickel during the melting. These oxides are absorbed and produce thick, pasty metal which will not run at all. This can be overcome, to a certain degree, by the use of plenty of charcoal on the metal during the melting in order to prevent access of air, but even with this care, the German-silver does not cast well in sand. The oxide invariably forms to a greater or less extent. It is necessary to add some reducing agent in order to render the castings sound. Manganese or aluminum are both used, but for sand castings aluminum has proved very satisfactory, while manganese has been found excellent for rolling mill work and is extensively employed. The addition of a very small quantity of aluminum to your German-silver is all that is desired. From 2 oz. to 4 oz. to 100 lbs. of the metal will be all that is required and will make the metal run free and sound in sand. Aluminum is very extensively employed in making German-silver sand castings as it has been found so satisfactory.

Question No. 1117. We manufacture sheet copper that is cold rolled and then buffed on one or both sides. While these copper sheets have an excellent surface after buffing, they tarnish after they reach the customer or frequently when in stock at our mill. We do not believe that the quality of the copper is the cause, as it is the best brand of Lake Superior copper obtainable. For the majority of work we are using the Calumet & Hecla brand of Lake copper and find that this tarnishes as quickly as any other. Is there anything that we can use to overcome the tarnishing?

Answer. There is nothing the matter with your methods or the copper. The reason for the tarnishing is that copper, when exposed to the air "simply tarnishes" from oxidation or sulphurous fumes. In other words, "it is nature of the beast." You can overcome it only by lacquering the copper after buffing. If brass and copper did not tarnish upon exposure to the air, the lacquer manufacturers would not be able to make a living, nor would there be any demand for gold or nickel plated goods.

QUESTION No. 1118. What is the best metal to be used for hardening aluminum to be made into sand castings?

Answer. This will depend upon the use to be made of the castings. Both copper and zinc are used for hardening aluminum, but if the castings are large and complicated, advise the use of copper only for hardening. Use 92% aluminum and 8% copper. This is the best casting mixture and does not crack in the mold like the aluminum mixture containing zinc. For small castings a good mixture is 82% aluminum, 15% zinc, and 3% copper. This mixture drills and threads well.

QUESTION No. 1119. We have trouble in plating malleable iron castings in our nickel solution. It works all right on gray-iron and brass, but peels on malleable iron after the castings have been in use. We have plated the nickel directly on the iron, and have also given it a preliminary "strike" of copper, but the results are the same. In the latter case both the nickel and the copper strip off. Will you kindly explain the trouble?

Answer. Your difficulty is apparently in the cleaning of your malleable iron previous to plating. The fact that the solution works all right on other metals indicates that it is itself all right. We believe you will find that your malleable iron is either rusty or has been "over-pickled." Over-pickled iron, either cast or malleable is quite a common occurrence. The surface is then coated with a film of carbon, left from the pickling operation for the reason that the iron dissolves in the acid and leaves it on the surface, and the deposit does not adhere. Take one of your castings and scour it well with sand or pumice and then plate it. If the deposit adheres, then the difficulty is undoubtedly on the surface of the malleable iron and over-pickling may be looked upon as the cause.

QUESTION No. 1120. We have some trouble in casting nickel in iron molds. The heat of the nickel burns the surface the iron, causing the casting to become rough and also injuring the iron mold. How can this difficulty be avoided?

Answer. There is only one way in which you can avoid the nickel burning its way into the iron mold and that is to take care that the molten nickel does not strike on one spot all the time in pouring. This is the cause of your trouble. The molten metal, striking in one place all the time, actually melts the iron. If you set your mold vertical (if it is a closed mold) and pour straight down into it, the metal will not strike on the mold at all, but upon itself, like water falling into a pool. In this manner you can avoid spoiling the mold and a better casting can be obtained. There is no way in which you can avoid it except in this manner as no material can be put on the mold that will prevent it.

QUESTION No. 1121. Is barium cyanide used to any extent in the United States for regenerating cyanide plating solutions? We have heard that it was being used in Germany and would like to know where we can obtain it?

Answer. While barium cyanide is an excellent material for regenerating cyanide plating solutions, particularly silver solutions, as it removes the carbonates in it and changes them back to cyanides, it cannot be obtained in this country except at a price that prohibits its use. This is to be regretted as it would undoubtedly find a ready sale. It is used in Germany.

QUESTION No. 1122. In making bronze memorial tablets by casting bronze in sand, the following obstacle has been encountered: The tablets are dipped in an acid dip in order to clean and brighten the surface. After dipping, a number of black spots are always present which spoil the appearance. These spots have more resemblance to patches than anything else? With this exception the tablet is good. What causes these patches? We cannot avoid them.

Answer. The patches are caused by a white tin alloy or metallic lead separating out (so-called "liquation") when the bronze cools. Either will cause it and which separates will depend upon what mixture you are using. Frequently both separate. When the bronze, from which the tin alloy or lead has separated in the form of patches, is dipped, they turn black; while the bronze itself becomes bright. The remedy is to use the right mixture. You will gain nothing by the use of scrap or a poor, cheap mixture for this class of work. Use standard "Statuary Bronze" mixture which is the following:

Copper	90 lbs.
Tin	6 lbs.
Zinc	3 lbs.
Lead	1 lb.

If you are using this mixture and still have trouble, then the difficulty is in your melting. Try adding a small amount of phosphor-tin or phosphor-copper (not over 2 oz. to 100 lbs. of metal) and also melting the bronze twice. If, however, you are using too much lead in your bronze, you will not be able to obtain a good dipped surface.

QUESTION No. 1123. Can sheet copper be tinned by electrodeposition instead of the hot process and is the coating durable and bright? We desire to tin sheet copper, but cannot use the hot process.

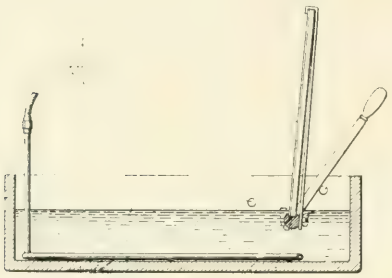
Answer. Copper can be tinned very satisfactorily by electro-deposition. Use the following solution:

Water	1 gallon
Potassium Cyanide	5 oz.
Caustic Potash	1 oz.
Tin Chloride	1 oz.

Dissolve the caustic potash in the water and then add the tin chloride (tin crystals). Afterwards dissolve the cyanide in it. Use the solution cold or slightly warm (if in winter.) From 2½ to 3 volts are employed. As soon as the tin deposit becomes dead, take out and scratch-brush when it will become bright. The deposit is not as heavy as that produced by dip tinning in hot tin, but is satisfactory for many purposes.

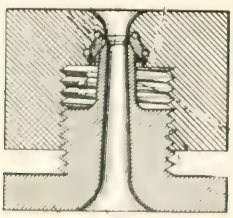
Patent Abstracts.

1,016,487, Feb. 6th. 1912. ETCHING APPARATUS. James S. Freer of Rutherford, N. J. An apparatus for hastening the operation of etching flat plates of metal and also producing more uniform results than in the ordinary etching tub. The plate is placed face down in the solution and the etching liquid



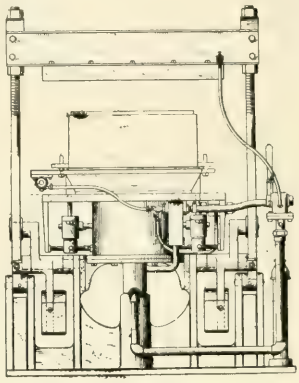
(usually perchloride of iron solution when half tone plates are etched) is forced upon the surface to be etched by means of fine jets of compressed air. A pipe coil is placed in the bottom of the tank and is perforated with fine holes through which the air escapes. This serves to stir up the solution and causes the etching to take place more rapidly.

1,015,913 and 1,015,914, Jan. 30, 1912. WIRE DRAWING APPARATUS. John Stratton of Altrincham and Ernest A. Claremont of Old Trafford, Manchester, England. The invention relates to a die for drawing wire and owes its novelty to the fact that it is "yieldable." The die consists of two parts. One is funnel-shaped and screws into the other mem-



ber. The funnel-shaped member is the die proper and, when screwed in, becomes contracted and its diameter is decreased. In this manner it is claimed that the wear of the die is adjusted. Ball bearings are used in one of the varieties of this patent to render the adjustment more readily made.

1,016,530, Feb. 6, 1912. POWER MOLDING MACHINE. Charles Edwin A. Thompson of Bridgeport, Conn. Assignor to the Bridgeport Foundry & Machine Co., of Bridgeport, Conn. A molding machine in which both the ramming and lifting of the flask are carried out by steam or pneumatic



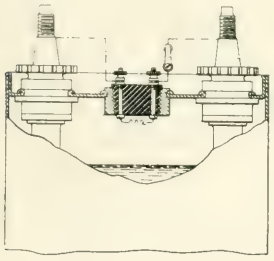
power. Pneumatic power is preferred as it is easier to manipulate and is free from the disagreeable features of condensation like steam. The machine is so constructed that the flask is raised with great smoothness and without vibration from perfect parallelism. Injury to the molds is thus avoided. A special form of vibrator is used on the machine for vibrating the pattern before lifting the flask.

1,018,385, Feb. 20, 1912. VARNISH. Leo H. Baekeland of Yonkers, N. Y. Assignor to the General Bakelite Co. of New York City. An initial condensation product of phenols and formaldehyde are first made in the manner described in U. S. Patent, 954,666 Apr. 12, 1910. The product is then dissolved, to make a varnish or lacquer, in the following manner: Condensation product, 100 parts; wood-alcohol, 75 parts; acetone, 40 parts; and amyl-alcohol, 5 parts. It is stated that the amyl-alcohol, being non-volatile at ordinary temperatures, renders the film of varnish or lacquer, tough and flexible.

1,015,610, MACHINE FOR VENTING AND WIRING CORES. John E. Boegen of Berwyn, Ill. The machine vents a number of cores at once and also inserts the wires. This is usually done by hand and the machine is intended to supplant hand labor for this core making operation.

1,017,629, Feb. 13, 1912. MANUFACTURING AND REFINING COPPER ALLOYS. Walter S. Rockey and Hilliary Eldredge of New York City. Assignor to the Metallurgical Research Co., a corporation of Arizona. A method of making alloys of copper, such as brass or bronze. The alloying metal, such as the zinc or tin, is melted in a crucible under boracic acid. The copper is melted in another crucible under charcoal and then poured into the zinc or tin and the whole stirred. It is claimed that the loss of the zinc or tin is thus prevented. By this method it is stated that the temperature can be maintained at the right degree for the alloying and the loss is greatly reduced.

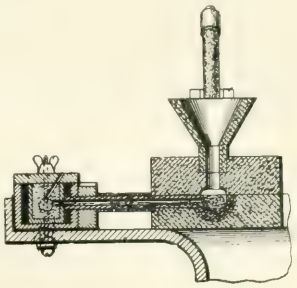
1,016,874, Feb. 6, 1912. MEANS AND METHOD FOR PREVENTING DEPLETION OF ELECTROLYTE. Thomas A. Edison of Llewellyn Park, N. J. Assignor to the Edison Storage Battery Co., of West Orange, N. J. The object of this invention is to prevent the escape of electrolyte in a storage battery. When the battery begins to "gas,"



liquid electrolyte escapes with the gas. In order to obviate it, a platinum wire, heated by the electric current is placed in the top of the cell. This ignites the hydrogen and oxygen gases that escape from the electrolyte, and they are then changed back to water. In this manner the electrolyte is maintained at a constant level as there is no escape of gas and none of the electrolyte is carried off as spray.

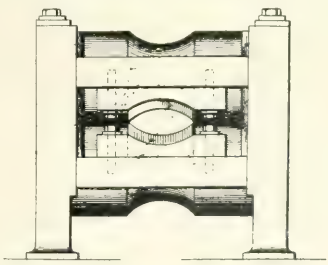
1,015,473, Jan. 23, 1912. MACHINE FOR STRAIGHTENING METAL BARS. Latham H. Brightman of Lakewood, Ohio. The object of the invention is to provide a machine for straightening bars of angular cross section, and, at the same time, to remove any longitudinal curvature and twist that may be present. A number of straightening dies are used and are contained in a flier frame adapted to revolve around them.

1,015,818 and 1,015,819, Jan. 30, 1912. CASTING MACHINE. John McManus Jr., of Lynn, Mass. A combination of an electric furnace with a centrifugal machine. The apparatus is intended more particularly for making small castings such as dental work. The metal is melted in a small crucible by means of an electric arc, and, when this has been accom-



plished, the apparatus is started revolving and the molten metal is thrown into the mold by the centrifugal action. If desired, the flask may be wound with resistance wire so as to heat it for the reception of the metal and thus increasing the fineness of the detail of the casting.

1,017,283, Feb. 13, 1912. ROLLING MILL GUIDE. Henry J. Davis of Niles, Ohio. The guide is intended for hot rolling mills and is



designed to obviate the spreading of the end of the bar as it emerges from the rolls.

1,016,771, Feb. 6, 1912. METAL TUBE BENDING MACHINE. Alfred H. Plante of Atlanta, Ga. Assignor to the Atlanta Metal Bed Co. of the same city. The machine can also be used for bending metal rods and bars as well as tubing. It is designed particularly for bending the material used in the manufacture of metal beds. The machine is automatic in action and the tube is bent without crushing or flattening at the bend. This is accomplished by grooved wheels of the shape of the tubing, which follow the bend and prevent distortion when the bending takes place

Trade Items.

The plant of the Canton Brass & Machine Co. of Canton, Ohio was damaged by fire on Feb. 28th, to the extent of $3,000.

A site has been purchased by D. Ulllmann' Sons of Buffalo, N. Y. who will erect a plant on it for the smelting and refining of scrap metals. The site is at Metcalf St. and the West Shore Railroad.

The Chase Rolling Mill of Waterbury, Conn., has sent out a circular under date of March 2nd. announcing that their base price for brass rod, sheet and roll brass, and brass wire is 14¼ cents per lb. taking effect at that date.

The Stanley Bronze Company has been organized in Bridgeport, Conn., to manufacture brass and bronze castings. A plant has been erected at State and Dewey Sts., and is already in operation. W. D. Stanley, formerly with the Bridgeport Brass Co. is one of the organizers of the company.

The main offices of the Ansonia Brass & Copper Co. will shortly be removed to Ansonia, Conn., from New York City, where they have been located for many years. This is one of the changes recently made by the American Brass Co. of which the Ansonia Brass & Copper Company is one of the subsidiary companies.

The name of the Comstock-Wellman Bronze Co. of Cleveland, Ohio has been changed to the Wellman Bronze Co. This company conduct a brass foundry and were organized a number of years ago. At a recent meeting of the stockholders, the following officers of the company were elected: President, S. T. Wellman; vice-president and treasurer, F. S. Wellman; and secretary, H. G. Wellman.

The United States McAdamite Metal Co., Brooklyn, N. Y. have purchased land in Detroit, Mich. for a branch factory and will erect an aluminum foundry upon it. The new foundry will be 90 x 150 feet and will be located at Isabella and E. St., in Detroit. Another building 50 x 100 feet will also be erected. This company manufactures "McAdamite" a variety of aluminum and which is extensively used for automobile and motor boat castings. Their present plant is located at Rapelve St., Brooklyn, N. Y.

The Ajax Metal Co. of Philadelphia, Pa., have purchased a site of 25 acres of land on the Delaware River at Orthodox and Richmond Sts and will erect a new plant upon it for the smelting of scrap metals. Work will shortly be begun upon it. The Ajax Metal Co. are one of the largest smelters and refiners of copper bearing materials in the United States and the rapid increase in their business have made this change necessary. Their present plant at 40 Richmond St. is not sufficiently large to allow for further expansion and this necessitated the purchase of the additional site.

Maintien Bros. & Ellict of North Attleboro, Mass., manufacturing jewelers, are to move their plant to the Plainville Factory Trust Building, Plainville, Mass.

The American Silver Co., of Bristol, Conn., manufacturers of silver plated flat-ware and hollow-ware, is to erect a new factory building at Main and Pearl Sts. and which is to be 30 x 50 feet and two stories high.

C. E. A. Thompson, formerly with the Bridgeport Foundry & Machine Co. and the Bridgeport Deoxidized Bronze & Metal Co., of Bridgeport, Conn., is now connected with the Millett & Harley Co., (formerly the Millett Brass Co.) of Springfield, Mass., in the capacity of sales-manager.

Walter G. Stringer has been made manager of the Philadelphia office of the Joseph Dixon Crucible Co., of Jersey City, N. J. Mr. Stringer succeeds Wm. J. Coane, who recently resigned his position to accept the office of third vice-president of the Ajax Metal Co. of Philadelphia. Mr. Stringer has been connected with the company for fourteen years.

Davenport & Keeler, the well known industrial and sanitary chemists of New Britain, Conn., have incorporated with a capital stock of $10,000 of which $5,000 is paid in. Their business has grown to such an extent that this expansion was made necessary. The officers of the new company, which still retains its former name, are as follows: President, Warren I. Keeler; vice-president and manager, Robert H. Norton; and secretary and treasurer, Milton W. Davenport.

The Duplex Metals Co. of Chester, Pa., manufacturers of copper coated steel wire, have recently installed equipment for rolling sheets at their mill, and will shortly be in a position to turn out copper coated sheets, strips, plates and small structural shapes. In addition they will make small manufactured goods such as nails and staples. The process used by the company consists in first coating a steel billet with copper by dipping it into molten copper. It is then rolled in the usual manner. Steel with a tenacious coating of copper is, therefore, produced at a low cost.

The Corbin Motor Vehicle Co., of New Britain, Conn., manufacturers of the "Corbiu" automobiles, have decided to discontinue the manufacture of automobiles and the plant will be closed. Their entire stock has been sold. This company was started a number of years ago to manufacture automobiles and was one of the affiliated concerns of the P. & F. Corbin Company and the Russell & Erwin Company. The stock was controlled by members of these companies. It is reported that the late Philip Corbin was opposed to the manufacture of automobiles and that the closing of the plant was also desired by other members of the companies controlling the Corbin Motor Vehicle Co.

The Betts-Coultas Company has been organized in Providence, R. I. and has started to manufacture jewelry at 220 Eddy St. in that city.

The growth and importance of the automobile trade is apparent from the fact that the Waltham Watch Co. of Waltham, Mass., have commenced the manufacture of automobile clocks. Heretofore they have confined their business exclusively to the manufacture of watches.

The American Thermos Bottle Co. of New York City is to move to Norwich, Conn., where a new factory is to be built. This company recently entered into negotiations with the Board of Trade of Norwich with the result that they will move to that city. A capital of $75,000 has been raised by the Board of Trade of Norwich for the company.

The Cohannet Silver Co. of Taunton, Mass., manufacturers of silver plated ware, and whose plant was recently destroyed by fire, has filed suits against twenty-seven insurance companies to recover insurance on the plant. The companies have refused to pay the insurance on the plant, and the suits have been brought to compel them to do so.

The Carroll Lock Co., Oakwood, Dayton, Ohio, has succeeded the Carroll Engineering & Mfg. Co., of that city. The manufacture of combination locks for buildings, safes and similar purposes is to be carried on. The lock is free from complications and is the invention of Thomas Carroll, for 15 years chief inventor of the National Cash Register of Dayton, Ohio. The present quarters of the company are in the Beaver Power Building, but later a plant will be built.

M. L. Barrett & Co., 233 West Lake St., Chicago, Ill. the well known lacquer manufacturers, say that "Printer's ink will sell lacquers; but no amount of printer's ink will make a poor lacquer stay sold or bring reorders." Nothing but good, wear-resisting, element defying lacquers will do that. The Barrett lacquers are as follows: No. 105, No. 110, No. 22 Dead-Black, Water-Dip, T. T. (all colors) and many others. This company solicit the opportunity to tell about the good qualities of their lacquers, and if any lacquer user will write them, they will be glad to impart some very interesting information.

The business of the Mumford Molding Machine Co. of Plainfield, N. J., manufacturers of molding machines, will now be handled by the Vulcan Engineering Sales Company, which has been organized to take over the business of the Hanna Engineering Works of Chicago, the Mumford Molding Co. of Plainfield, N. J. and the Q. M. S. Company of New York. The officers are: President, F. K. Gilbert; and P. W. Gates, secretary and treasurer. E. H. Mumford will continue in the capacity of vice-president and general-manager of the Mumford Molding Machine Co. as heretofore. The offices of the Vulcan Engineering Co. are at 30 Church St., New York City and in the Fisher Building, Chicago, Ill.

The name of the Norwalk Iron & Brass Foundry Co. of Norwalk, Ohio, has been changed to the Norwalk Foundry Co. The capital stock of this company was recently changed from $10,000 to $25,000. Some extensive improvements are planned.

The plant of the United Brass Mfg. Co., of Cleveland, Ohio, manufacturers of plumbers' brass goods, and which went into bankruptcy a short time ago, has been sold to the Gas Fixture & Brass Co., of that city and will be newly equipped for making gas fixtures and plumbers' supplies.

The Cambria Steel Co. of Johnstown, Pa., have installed two presses for making briquettes of iron ore by the Ronay process. These two presses turn out 250 tons per day. The Roany process is creating considerable interest in the brass trade on account of the possibility of briquetting brass chips and other material so that they can be melted with less melting loss than at present.

Attention is called to the "Nonesuch" Stop Carboy Rockers for use on acid carboys. These carboy rockers are manufactured by Rockhill & Vietor, 114 John St., New York City and patent has been applied for. They allow a carboy of acid to be tilted for pouring as easily as small barrel can be rolled over, and the acid is not spilled, but runs out in the manner desired. This rocker is provided with an accessory in the shape of a special celluloid vent tube attachment which greatly assists the pouring of the acid.

The next meeting of the American Society for Testing Materials is to be held in the Hotel Astor, New York City on March 28th. and 29th. Two sessions will be held each day and the meetings will be devoted to the reports and discussion on standard specifications. Among the specifications to be discussed are those for "Hard Drawn Copper" and the "Non-Ferrous Metals and Alloys." The following officers have been nominated for the election to be held: President, R. W. Hunt; vice-president, A. W. Gibbs; secretary-treasurer, Edgar Marburg. Executive committee, J. B. Loeber, A. A. Stevenson, and S. W. Stratton.

It is proposed to change the name of the American Brass Founders' Association to the American Institute of Metals, and members have been called upon by W. M. Corse, the secretary, to vote upon such a change in the constitution. This is believed to be advisable on account of the fact that the name will indicate a much broader field. The present name indicates that the work of the society is confined to brass exclusively and it is desired to increase the scope to all non-ferrous metallurgy. This has been done in England in the Institute of Metals and it is expected that the American transformed society will be conducted more along the lines of the English association. The next meeting will be held in Buffalo in September and this change has been made on account of lack of facilities for holding the Convention before this time.

The Reeves Mfg. Co., Canal Dover, Ohio, manufacturers of sheet steel, are to erect a galvanizing plant.

The Nehring Insulated Wire & Mfg. Co. has been incorporated at Sycamore, Ill. with a capital stock of $30,000 to manufacture insulated copper wire, and also electrical appliances.

The Troy Scale Co. of Troy, N. Y., has secured an option on the plant of the Bennington Machine Works of Bennington, Vt., and it is expected that they will move there within a short time.

The Celluloid Zapon Co., 310 Fourth Ave. New York City, call attention to their "Rose-Gold Lacquer" No. 2 for spraying. It contains no analine dyes and consequently holds its color. Sample will be sent upon request.

The A. Y. McDonald Mfg. Co. of Dubuque, Iowa, manufacturers of plumbers' brass goods and brass founders, have completed plans for the erection of a four story addition to their plant. This addition will be 100 x 260 feet and is to cost $75,000.

The M. S. Wright Co. of Worcester, Mass., manufacturers of piano hardware and vacuum cleaners, has taken another floor at 51 Jackson St. in that city. This new space will be devoted to the manufacture of vacuum cleaners.

P. Pryibil, 512 West 41st. St., New York City, manufacturer of spinning lathes for spinning sheet metals of all kinds, is now manufacturing buffing and polishing machinery for the plating, polishing and brass finishing trades.

Albert A. Moers, 24 Stone St., New York City, is now in the market for copper bearing material of all kinds and solicits the opportunity to quote on samples. He is prepared to make very attractive prices for small or large lots.

The Hanson & Van Winkle Co., Newark, N. J., manufacturers of plating and polishing supplies and equipment, are now placing a new gear drive on their plating barrel that has been so successful in the plating of small metal goods in quantities. This improvement renders the plating barrel even more easily manipulated than before.

A company is being formed by P. M. Wege of Marietta, Ohio, together with others interested, for the manufacture of metal furniture. It is expected that a plant will be started in Grand Rapids, Mich., and that operations will be commenced upon it within a short time. Mr. Wege was formerly superintendent of the General Fireproofing Co., of Youngstown, Ohio.

The Connecticut Computing Machine Co. of New Haven, Conn. has gone into the hands of a receiver and the affairs of the company are to be wound up and the corporation dissolved. A large amount of money, it is stated, was spent in developing a computing machine which was found quite practical, but which the directors did not care to place on the market.

The Buckeye Iron & Brass Works of Dayton, Ohio, is having plans drawn for a new building and which will be six stories high.

The Polytechnic Shop, 289 Poplar St., Memphis, Tenn. is equipping a brass department at their plant. Welding will also be carried on.

The Union Art Metal Works, Trenton, N. Y. have installed a brass plating plant at their works. Snedecker & Rue are the proprietors.

The Wire Products has been organized in Rockford, Ill. with a capital stock of $25,000 to manufacture wire goods. The incorporators are E. C. Traner, V. B. Nelson and F. G. Hoagland.

The new building which the Sterling Brass Co., of Cleveland, Ohio is erecting will contain 8,000 sq. feet of floor space. It will be made of brick and steel and the manufacture of plumbers' brass goods will be carried on.

Post & Lester, 112 Allyn St., Hartford, Conn., are now manufacturing a line of automobile supplies, such as horns and accessories and are carrying on brass finishing and lacquering.

The Waterbury Metal Products Co., 23 Jefferson St., Waterbury, Conn., solicit job plating of any kind or metal finishing from concerns who do not have their own plating plant. They would like to submit estimates.

The new foundry of the G. E. Hoglund Foundry Co., at Gardner, Mass., has been completed and the equipment installed. Brass bronze and iron castings of all kinds will be turned out for the jobbing trade and the most modern appliances have been installed.

The Hammond Brass Works has been incorporated in Hammond, Ind., with a capital stock of $35,000 to manufacture valves and similar brass goods. The incorporators are C. H. Mayer, J. E. Brennan, William Wolter, J. E. Lammering and F. S. Carter.

The Tolhurst Machine Works of Troy, N. Y., manufacturers of the "Tolhurst" centrifugal machine for drying out small metal goods after plating, dipping, or coloring and which dispenses with the use of sawdust, have appointed Ernst Bernheim, Ludw. Loewe-Haus, Düsseldorf, Germany, their European representative and he will look after the foreign trade.

J. W. Force of New Britain, Conn., the well known electro-chemist of many years experience is now selling formulas for making "Electro-Chromic" colors by electrodeposition. Verde effects, statuary bronze, greens, yellows, and different colored backgrounds may be made on any metal body. The process is especially adapted for use on lamps, chandeliers, and other art metal work. The cost will not exceed 15 cents per gallon. Mr. Force guarantees satisfactory results. Correspondence is solicited when particulars will be given. Mr. Force has had 45 years of practical experience and is one of the best known platers in the United States.

A new building, 24 x 111 feet, two stories high, is to be erected by the Star Pin Co. of Shelton, Conn., manufacturers of brass pins.

The Risdon Tool Co., of Waterbury, Conn., are making preparations to move to Naugatuck, Conn.

The Little Giant Stove & Novelty Co. has been formed at Ft. Wayne, Ind., with a capital stock of $40,000 for the purpose of manufacturing stoves.

The capital stock of the Doylestown Aluminum Ware Co. of Doylestown, Ohio, manufacturers of aluminum cooking utensils, has been increased from $10,000 to $25,000.

The Mauston Aluminum Company has been organized at Mauston, Wis., with a capital stock of $16,000. The incorporators are J. L. Marvin, W. F. Mensor and M. L. Bunnell.

The No-Dust Drying Machine Co., 40 Clifford St., Providence, R. I., manufacturers of machines for drying metal goods, is contemplating the enlargement of their plant.

The De Tamble Motor Co., of Anderson, Ind., manufacturers of automobiles, has been reorganized and the capital stock increased to $200,000. Charles H. Walters has been made general superintendent.

The Hart & Cooley Co., of New Britain, Conn., manufacturers of steel registers and lockers, are to erect an addition to their factory 45 x 123 feet. It will be two stories high with a basement.

The Sawyer Down Draft Mfg. Co., of Mansfield, Mass., are to build a factory for the manufacture of a new type of water heater. A building 50 x 150 feet is to be constructed for this purpose. Operations are to be commenced this spring.

The Pratt & Cady Co., of Hartford, Conn., manufacturers of valves and hydrants, are to increase their capital stock from $400,000 to $500,000. The plant will be enlarged. The growth of the business has been such as to warrant this enlargement.

The Thermo Stove Co., of Plainfield, N. J. recently incorporated, will make gas, electric and alcohol stoves of the so-called "fireless" type. Manufacturing operations will be commenced within several months and considerable machinery in the way of presses will be needed.

George B. Pickup, formerly connected with the mechanical department of P. & F. Corbin of New Britain, Conn., hardware manufacturers, has been made superintendent of the plant of the Universal Machine Screw Co., of Hartford, Conn., manufacturers of screw machine products.

The Turner Brass Works of Sycamore, Ill., are now manufacturing a hot-blast, tubular torch which has been found very useful in the foundry for drying molds. This torch contains 3 quarts of gasoline and can be held under the arm of the operator while being used. The torch can be used in any position and is made of 2 in. brass tubing, 5 feet long.

Fire recently damaged the brass foundry of Glantz & Johnson of Jamestown, N. Y.

The Engman-Matthews Range Co. of South Bend, Ind., has been incorporated with a capital stock of $200,000 to manufacture stoves, ranges, etc.

The Nyberg Automobile Co. has been incorporated in Chattanooga, Tenn., with a capital stock of $100,000 to manufacture automobiles. A new factory building is to be erected at once.

The Keith-Gara Co., 31st. and Ludlow Sts. Philadelphia, Pa., manufacturers of metal novelties, recently enlarged their plant by taking the whole of the floor, part of which was occupied by them.

The new plant of the Aluminum Goods Mfg. Co., recently erected at Manitowoc, Wis., at a cost of $200,000, has been placed in operation. A large line of aluminum novelties and other aluminum goods are manufactured.

The new plant of Isaac A. Sheppard & Co., at Erie Ave. and Sepviva St., Philadelphia, Pa., stove manufacturers, has been commenced. Two buildings are to be erected at this time. Electricity will be used for general power purposes.

Walter O. Amsler, D. Sc., Pittsburgh, Pa., is sending out a catalogue to the trade, describing the "Amsler" gas producer for the manufacture of gas for industrial purposes. This catalogue contains a large amount of information regarding producers and producer gas.

The Koken Barners' Supply Co. of St. Louis, Mo., manufacturers of barbers' chairs, supplies and equipment, has completed plans for the erection of a new factory to cost $70,000. It will be equipped for the manufacture of metal barbers' chairs. New plating equipment will probably be needed.

Obituary.

Richard R. Mitchell of the Robert Mitchell Co. of Montreal, Canada, died on Feb. 12th. Mr. Mitchell was vice-president of the American Brass Founders Association for Eastern Canada.

Hiram N. Turner, president of the E. & T. Fairbanks Co. of St. Johnsbury, Vt., scale and valve manufacturers, died at his home in that city on Feb. 16th, aged 72 years. He was president of this company since 1889 and previous to this time was traffic manager of the Boston & Lowell Railroad.

John H. O'Donnell of Waterbury, Conn., the well known inventor of wire drawing machinery, died on Feb. 27th, aged 48 years. At the time of his death he was connected with the Waterbury Machine Co., of Waterbury, Conn., in the capacity of superintendent. Mr. O'Donnell was one of the best known inventors and authorities on wire machinery and had invented many of the types of continuous machines now in use.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.19
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia), 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.07¼
Arsenic, Metallic	lb.	.15
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.75
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitriol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.14¾
Copper, Lake, (cask)	lb.	.15
Copper, Electrolytic, carload)	lb.	.14⅝
Copper, Electrolytic, (cask)	lb.	.14⅞
Copper, Casting, (carload)	lb.	.14⅜
Copper, Casting, (cask)	lb.	.14⅝
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Copperas, see Iron Sulphate.		
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Fluor-Spar	lb.	.01¼
Fusel-Oil	gal.	3.50
Gold Chloride	dwt.	.60
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	.93
Mercury, Metallic (Quicksilver)	lb.	.40
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.40
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	25.00
Platinum Metallic	oz.	46.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.04
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.58⅛
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone) in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.33¾
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc Carbonate, dry	lb.	.19
Zinc Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.06⅞

THE BRASS WORLD AND PLATERS' GUIDE

VOL. VIII. BRIDGEPORT, CONN., APRIL, 1912. No. 4.

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Contents for April.

Alloys, Limit of Accuracy in Analyzing 141
Aluminum Alloy, Another 119
Aluminum, Use of Titanium for Purifying 126
Anode Connection, Improved 131
Babbitt-Metal, Invention of 143
Bakelite and its Uses 138
Brass Foundry Mixtures, Standard 121
Brass Sheet, Specifications for High 132
Brass and Bronze Plating Solutions 129
Brass, Method of Adding Aluminum to 115
Brass Analysis, Limits of Accuracy in 141
Brass in England, Melting 137
Buffing, Reducing the Cost of 141
Cutlery, New Method of Making Steel 137
Detinning, Improvement in 126
Die Casting Apparatus, New 128
Enameled Ware, Testing 143
Fanning Mill, The "Baird" 134
Lacquers, Adherence and Wear of 116
Molds, Making Soft Metal Castings in 117
Nickel Plating Cutlery Before Silver Plating 135
Sampling, Standard Methods of 136
Silver, Tarnishing Qualities of 119
Silver Deposit Work, Storage Battery in 127
Steel Tubing, Making Square 146
Storage Battery in Electroplating, The 127
Tin, Pure Nigerian 123
Titanium, Alloying Metals with 143
Titanium for Purifying Aluminum 126
Tumbling, Finishing Steel by 120
Tubing, Chrome Steel 141
Valve Castings, Stopping Leaks in 134
Valve Seats, Cobalt-Chromium Alloy for 120
Zinc, Strength of Rolled 123

The Most Satisfactory Method of Adding Aluminum to Yellow Brass.

The very extensive use of aluminum in yellow brass castings at the present time has been instrumental in bringing up the question of the best method of adding it. The great benefit of aluminum in yellow brass has now been thoroughly demonstrated and with the exception of goods, such as plumbers' brass goods, and valves, to stand pressure, it is almost exclusively used in making yellow brass sand castings. It renders the castings sounder and free from pin-holes to a marked degree. The brass runs sharper, more pieces can be put on a gate, and the castings come out of the sand cleaner. Brass founders have fully realized these advantages.

The natural method of adding aluminum to yellow brass is to introduce it into the brass just before pouring. This is the method generally used, but is open to the objection that the amount of aluminum used is so small that it is difficult to alloy it with the brass, and it is apt to float on the top of the melted metal and waste; and also that the aluminum causes the brass to "flare," on account of the heat generated in the alloying and is apt to waste spelter. This latter objection is not a serious one except when considerable aluminum is to be added; but the first objection is an obstacle when certain results are obtained.

The best method of adding the aluminum to yellow brass is to make a rich alloy of zinc and aluminum by melting them together and

breaking up into small pieces. Take the following:

Zinc	7½ lbs.
Aluminum	2½ lbs.

This gives an alloy containing 25% of aluminum. It is added to the brass just as zinc would be added, and to obtain any desired weight, simply take four times the amount of the alloy of zinc and aluminum. This alloy, by the way, is frequently called "aluminized-zinc."

If, for example, it is necessary to add 2 oz. of aluminum to brass, take 8 oz. of the alloy; and then take 8 oz. less of zinc in the mixture. For ordinary work, however, it will not be necessary to take any account of the zinc as it will practically make up for the loss in melting. All that is necessary to do, therefore, is to add 4 times the amount of the aluminum needed in the form of the zinc and aluminum alloy.

The use of this zinc and aluminum alloy instead of pure aluminum will prevent flaring and render it always certain that the right amount of aluminum is introduced into the brass. With the regular method of adding the aluminum alone, it is not positive that it all goes into the metal.

For ordinary yellow brass work, from 2 to 3 oz. of aluminum are used and this means that from 8 to 12 oz. of the aluminum and zinc alloy are required. If more is added, the brass becomes harder and is apt to shrink considerably. If less is used, then the full value of the aluminum is not obtained.

The Adherence and Wear of Lacquers.

The matter of adherence and wear of lacquers is a subject that concerns manufacturers of fine metal goods at the present time to a considerable degree. It particularly interests brass bedstead makers who are dependent, almost exclusively, upon the appearance and wear of the lacquer on their beds. If this does not hold, but peels or wears through very rapidly, then the reputation of the manufacturer is injured, and if it continues, he finds that he has lost what reputation he may have had. In other words, the lacquer is the principal part of a brass bedstead.

We bring up this subject to indicate that much of the difficulty is caused by the condition of the trade itself and the caprice of the consumer. They demand polished surfaces, and this fact is one of the greatest drawbacks that is encountered. Everyone knows how difficult it is to fasten anything to a glass surface, and if the surface is slightly greasy, then it becomes doubly difficult. The question of lacquering a highly polished and buffed brass surface partakes of the same disadvantages. There really is nothing upon which the lacquer can hold. A slight film of grease or oil, be it ever so small, also tends to prevent the adhesion of the lacquer.

We believe if brass bed manufacturers would educate the trade, in one way or another, either by putting out attractive designs, or by similar means, to take dead or matt finishes, there would be less difficulty and complaints about lacquers. It is reasonable to suppose that lacquer will hold better on a dead surface than on a smooth one. The tendency in art is towards dead surfaces, and this has been fully exemplified in photography, in which dead prints are now used for the most artistic effect and have supplanted the old fashioned glossy paper almost exclusively.

The fact that lacquer holds far more tenaciously on a dead surface seems to have been early appreciated, for many years ago, a brass bedstead manufacturer patented a process of producing a dead surface on the brass, purely for the purpose of rendering the lacquer more adhesive. His method was to impart to the surface of the brass a large number of minute and almost microscopic holes by means of a tool fitted with a number of needle-like projections. The surface could also be scratched by them. While this process does not leave a very artistic effect on the surface of the brass it indicates that the manufacturer was working along the right lines and appreciated the fact that a rough or dead surface is necessary for the proper adherence of the lacquer.

We cite this case and call attention to the problem of lacquering, simply to indicate that the lacquering difficulty which now confronts the manufacturer of brass bedsteads, is not so much one of lacquer as it is in the preparation of the surface.

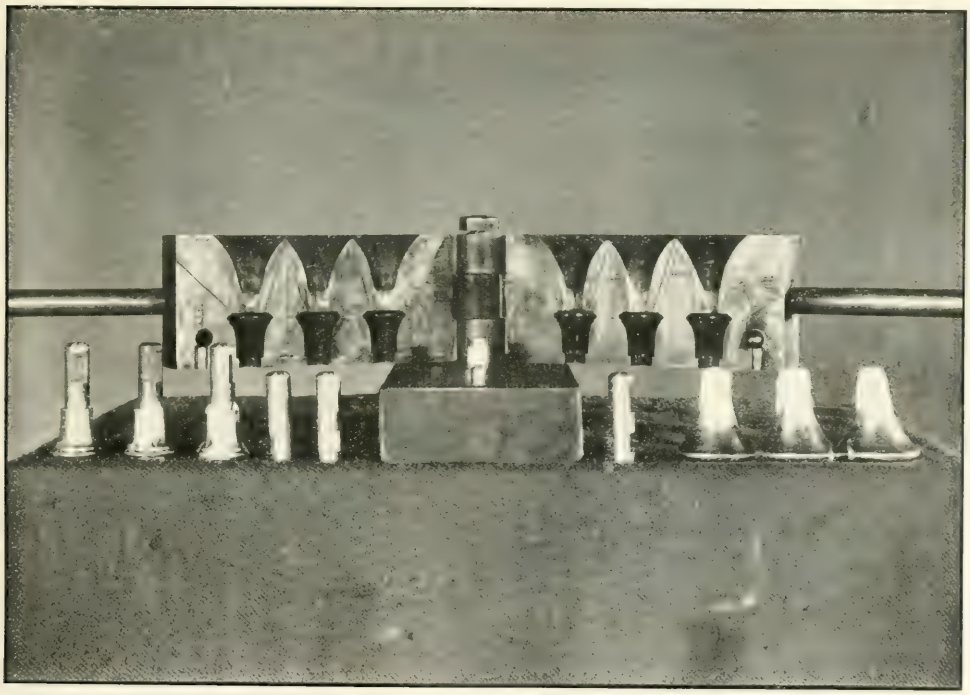
Yellow brass chips are often adulterated with sand, the oil in the chips causing the sand to adhere to them and escaping notice unless much care is used in the inspection.

The Manufacture of Accurate Soft Metal Castings in Metal Molds, With Note on Making of the Mold.

The extensive use of die-castings at the present time, many of them for purposes where a good ordinary casting would answer, perhaps, were it cast in an accurate mold, has brought to mind the fact that there are many instances in which metal castings can be employed with excellent results where now either brass castings with expensive machine work on them or die castings are used.

The soft metals used for casting in metal molds are of three kinds:

1. Alloys with tin base.
2. Alloys with lead base.
3. Alloys with zinc base.



Bronze Mold Used for Casting Soft Metal Shapes. A Steel Core, Slotted on One Side is Cast in the Soft Metal. Molds of This Kind May Often be Used for Making Work Almost Equal to Die-Castings.

The alloys with the tin base are known by the name of babbitt-metal, britannia-metal and often pewter. They are the best for many classes of work. While they are costly, they are strong and give good castings. For ordinary work, where good casting qualities are desired the following mixtures can be used:

Tin	95%
Antimony	4%
Copper	1%

The alloys with the lead base are the cheapest and can be used for a large variety of work. They cast very well and do not shrink but very little. These alloys are usually known under the name of "antimonial-lead" and where the strength is sufficient, they will be found very satisfactory. The most common alloy used for casting in metal molds is the following:

Lead	87%
Antimony	13%

If it is found, however, that this mixture does not run sufficiently free, then tin can be added as follows:

Lead	80%
Tin	10%
Antimony	10%

The tin in the mixture will cause the metal to run very sharp and free and it can be used for the finest kind of detail.

As for the zinc alloys, let it be said that they are not particularly suited for casting in metal molds unless pressure is used. The sluggish nature of zinc will prevent it from

running into thin sections and taking a sharp impression, unless pressure is used. It may be used for large castings, such as bearings, but even with such castings, the results, without the use of pressure, are not good. It is advisable, therefore, to confine the manufacture of metal castings to alloys with the tin or the lead base. These will be found suitable for many classes of work.

In the illustration herewith shown, the making of a casting of soft metal is photographed. The mold itself is made in halves with a hinge at the back, to allow of easy opening. At the left the finished castings are shown. They are a small knob with a steel, slotted core inserted. The steel core is shown at the left. These cores are inserted in holes in the base plate and the mold closed. The metal is poured into the gates at the top. The mold is made to cast six pieces at once. The gates, shown at the right, are usually found broken off on account of the shrinkage. The web connecting the gate and the casting can be made quite thin so that it will usually break off in the casting.

It will be noticed that the castings have been vented by small vents running from the top outside of the mold. This is necessary in order to allow the air to escape. Unless this is carried out, the castings will be shrunken and have a depression in the top.

The use of steel cores in making soft metal castings is a matter that should be investigated by those who desire to use this kind of work. When employed, it is possible to make a very strong and accurate casting, and with little difficulty the steel cores are made on automatic machines at a small expense. Brass, copper or bronze cores may also be used if desired. The advantage of using them will be fully appreciated when it is realized that frequently both the advantages of screw machine work and die castings can be obtained. In ordinary die castings, the weakness of the metal is the main objection, but by casting the core in the mold, a strong casting is obtained. Threads may be cut on the core previous to the insertion, or other work done upon it.

In casting the metal, the whole mold, cores and all, should be warm, but not hot. If cold, the metal will not run well, and if too hot, the castings will shrink unevenly. The arriving at the right temperature is a matter that requires more or less skill, but the operator soon acquires it with a little practice. As the mold is constantly increasing in temperature when used, it is cooled by frequent immersion in water. The cooling, however, is not allowed to go on too much or the mold will become stone cold and the water will not evaporate from the surface. The idea is to cool the mold a little so that the metal will run well, but still not so much as to prevent the water from evaporating. When properly done, the water remaining on the surface after the mold has been removed, will almost immediately evaporate from the metal, leaving the mold in condition to cast metal in at once.

The making of the mold itself is a matter that requires more or less skill. In the first place, bronze is almost exclusively used for the purpose. Cast-iron is too hard to cut and a smooth mold is very difficult to make out of it. The metal, too, is apt to be porous and full of flaws. Cast-iron, except for large and rough molds, is never used. Steel is coming into use for some classes of work on account of the fact that the surface can be made very smooth and there is less danger, when the mold becomes hot, of the metal adhering to it. The cost of a steel mold, however, is excessive as it necessitates cutting the mold from a solid block.

The bronze molds have been found the most satisfactory and, as previously mentioned, are almost exclusively used. They can be cast soundly and almost in the finished condition. The natural softness of the metal allows chasing without difficulty so that the castings will come out in a practically finished condition. It must be taken into consideration that unless the surface of the mold is smooth, the castings will not come out in any better condition. This fact explains why steel molds have been used. The surface, when polished, allows castings to be made with a practically polished surface so that no finishing at all is required.

The mold herewith shown is illustrated to indicate the possibility of doing comparatively complicated work at a low cost. It may be instrumental in suggesting something to those who desire to use "pseudo" die-castings without the expense attached to them for small lots.

Experiments on the Relative Tarnishing Qualities of Bright and Dead Silver Deposits.

By H. H. Lester.

The rapid increase in the use of bright silver deposits on flat-ware within the past few years, has brought up the question in regard to the relative tarnishing properties of the bright and dead silver deposits used on this class of goods. It has always been a belief in a certain portion of the flat-ware trade, and also among a class of customers, that the bright silver tarnishes much more readily than the regular dead deposit. This has never been borne out by any facts but has been simply a matter of opinion.

The frequent tarnishing of silver-plated flat-ware while in stock has also brought up the question, and as this occurs more rapidly during the damp summer months than at other times, it seemed that there might be a possibility of the opinions being well founded. The bright silver owes its brightness to the use of bi-sulphide of carbon in the silver plating solution, and, therefore, it is believed that sulphur must be contained in the silver deposit, although this point has never yet been determined. At any rate, the solution contains sulphur, and as sulphur is the common cause of the tarnishing of silver goods of all kinds, the belief that a bright silver deposit tarnishes more readily than one that is dead and has been produced in a solution containing no bi-sulphide of carbon, seemed to be worthy of notice.

Taking this belief into consideration, it was deemed of interest to make some experiments on the subject to ascertain whether there was the least foundation for the idea. The experiments were all made on flat-ware and were carried out in the following manner:

On March 10th. 1911, 1 dozen tea-spoons, 1 dozen orange spoons and 1 dozen table spoons were taken as the test goods. They were plated on 18 per-cent German-silver with a heavy silver deposit in the usual manner and burnished and buffed in the regular way. All of the spoons were treated in exactly the same manner. The deposit on each was as follows:

Tea-Spoons....White or Dead Silver Deposit.
Orange-Spoons Bright Silver Deposit.*
Table-Spoons ..Bright Silver Deposit.*

The spoons were then finished, wrapped in tissue paper of the kind employed for this purpose and free from corrosive foreign substances, boxed and laid away.

On Sept. 12, 1911, six months afterwards, the spoons were examined. Two of the tea-spoons on the outside of the package had tarnished slightly on the edges. Four orange spoons had done the same. The table-spoons had not tarnished.

On Nov. 14, 1911, the tea-spoons had tarnished a little more on the edges and the others about the same.

On Feb. 27, 1912, over eleven months after they had been put away, all of the spoons on the outside had tarnished a little and the inside ones in the package had not tarnished at all. The bright deposits were tarnished no better nor worse than the regular or white silver.

It is evident from these experiments that there is no difference in the tarnishing qualities of the bright and dead (white) silver deposits. The tarnishing which took place, was undoubtedly caused by the paper or atmosphere, but as all tarnished evenly and the same, it can only be assumed that one silver deposit tarnishes as quickly as another.

Another Aluminum Alloy.

Another aluminum alloy has been added to the long list now in existence. This new one has been patented by Gaston Jacquier of Belgravia, near Johannesburg, Transvaal. It is composed of the following ingredients:

Aluminum	92%
Copper	5%
Bismuth	2%
Silicon	1%

It is claimed that this alloy is much more non-corrosive than the ordinary alloys of aluminum and that it will stand the corrosive action of sulphuric acid, cyanide solution, etc. It is proposed to use it for castings used around a mine and which come in contact with corrosive waters.

*Plated in a cyanide silver solution containing bi-sulphide of carbon.

The Method Used for Finishing Sheet Steel Articles by Tumbling.

Large quantities of sheet steel articles are blanked from cold rolled or hot holled steel. These articles then require plating in order to render them of good appearance and prevent rusting. When blanked, however, the edge of the article is sharp and frequently has quite a burr on it. Before ready for plating, this edge must be smoothed down and the burrs removed. In the case of small steel goods, it is impossible to grind the burr and sharp edge off on a wheel on account of the cost. Such goods must be made very cheaply. It is customary to tumble the articles to remove such imperfections and it is possible, when the right method is employed, to do an excellent job. One of the best experts in the business and who has had many years of experience in the manufacture of such work, gives us the best method of treating these small steel goods. He describes the process as follows:

"I will say that the grinding and polishing of small steel articles in a tumbling barrel is the hardest part of this line of work, as each piece may require a little different treatment. This can be learned only by trying out each new lot until the best way has been found and then sticking to it. In other words, it is necessary to use your head even on a mud barrel.

The method of tumbling the familiar articles made of sheet steel and known as "bottle openers" is the one now described Other similar goods, of course, can be tumbled in the same manner. The manner of tumbling them is as follows:

Fifty lbs. of the openers are placed in a water-tight, horizontal tumbling barrel with 150 lbs. of scrap steel. This steel can be in the form of any kind of loose stuff such as punchings or similar small shapes. The barrel should travel 2000 inches per minute at the circumference. Put in the barrel, 1 pail of sifted building sand; 1 lb. dissolved whale-oil soap; and 3 pails of water. Roll for 48 hours and vent the barrel every 12 hours to let the gas escape. Then wash all the mud from the work very carefully, and roll for 24 hours with the following: Water, 3 pails; whale-oil soap (dissolved in water) 8 oz.; floated silica, 4 oz.; sawdust, ½ pail

Wash again thoroughly and finish by tumbling again for 24 hours in the same kind of mixture, but omitting the silica. The steel must not look gray after having been finished, but have a clear bright surface.

After drying out, separate the scrap and string up on racks. Clean by means of an electric cleaner made of caustic soda standing at 8° Beaumé. Then strike in a hot cyanide copper, and if the steel is clean, the copper deposit will come out a clear, bright red.

Next plate for 1¼ hours in a nickel solution and buff with a 10 inch cotton buff wheel, using Vienna-lime composition. Wash in a boiling hot, strong solution of "Savogran" for 2 minutes and then rinse in hot water and dry in hard wood sawdust."

Cobalt-Chromium Alloy for Safety-Valve Seats.

Elwood Haynes of Kokomo, Ind., calls our attention to the fact that a cobalt-chromium alloy is particularly suitable for use as safety-valve seats. This alloy is now being manufactured by him and has been described in The Brass World from time to time. It can be made hard or soft as desired, with all the intermediate conditions and, if desired, can be produced as hard as tempered steel. In fact, Mr. Haynes is now manufacturing cutlery from it. The alloy he calls "Stellite." It owes its existence as a commercial alloy to the fact that, while it is as hard as steel and will take a fine cutting edge, it is very non-corrosive, even more so than pure nickel and rivals gold and platinum.

On account of its hardness and non-corrosive properties, it is an ideal material for the seats of safety-valves, the inventor says, for the reason that it does not wear and never corrodes while in use. It will not fail under the most severe conditions. At the present time, an alloy of nickel and copper (equal parts) is used for safety-valve seats, and while better than bronze, leaves much to be desired in the way of non-corrosive properties and hardness.

The method of adding vanadium to the copper alloys, such as the brasses or bronzes, is by means of cupro-vanadium. This alloy may now be obtained in commerce containing 5 per cent of vanadium

Standard Brass Foundry Mixtures and Method of Making Them.

By Erwin S. Sperry.

(Continued from Page 121, March, 1912)

Hardware-Bronze.

Large quantities of bronze castings are now used in the manufacture of builders' hardware and they are for purely ornamental purposes. These castings are not only employed in their natural finish, but many different kinds of

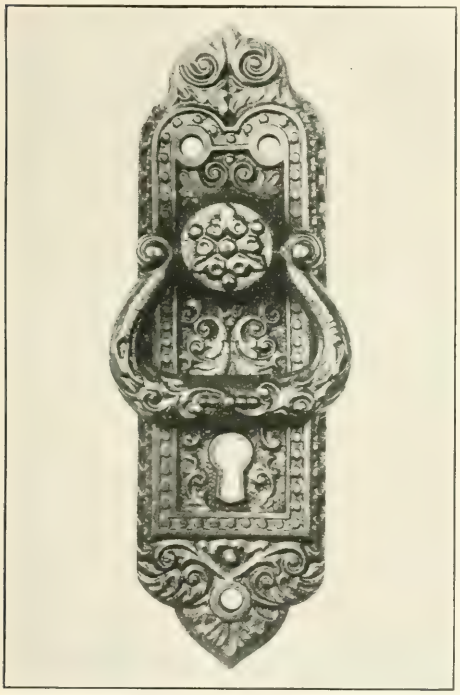


Fig. 1. Casting Illustrating Application of Hardware-Bronze.

fancy coloring are applied. Bronze lends itself excellently for this purpose and it takes many finishes that cannot be applied directly to yellow brass and only with great difficulty can be applied to plated iron or steel goods. Hardware-bronze is used for making the highest grade of builders' hardware, and it is the most satisfactory and durable of any kind of metal that can be used. Owing to its expense, however, large quantities of bronze plated steel are now manufactured to imitate it.

The requirements of hardware-bronze are not at all severe. The main requirement is that it shall have a bronze color. The next is that it shall cast well; and finally its cost must not be excessive. Good working qualities are also necessary as considerable drilling and cutting threads are necessary in the finishing of the castings for the market.

The use of bronze high in tin, such as "statuary-bronze" mixture is unnecessary in making hardware-bronze on account of its high cost. Such a mixture while giving the finest results is usually considered by makers of builders' hardware to be too costly. If, however, one desires the best mixture that can possibly be employed, irrespective of cost, then let the mixture given in THE BRASS WORLD, February, page 41 for "Statuary-Bronze" be used, but it is unnecessary and the results obtained by a cheaper mixture are just as good.

For a hardware-bronze to be used for making builders' hardware, use the following:

Copper	85 lbs.	or 850 grams
Tin	3 lbs.	or 30 grams
Zinc	9 lbs.	or 90 grams
Lead	3 lbs.	or 30 grams
Total	100 lbs.	or 1000 grams

Hardware-bronze must have a good surface and is usually dipped in an acid dip to clean the casting. In many instances, plain, flat surfaces have to be used, such as, for example, push and kick plates, and these are polished and buffed. Care must be used in melting the bronze to avoid pin-holes in such castings.

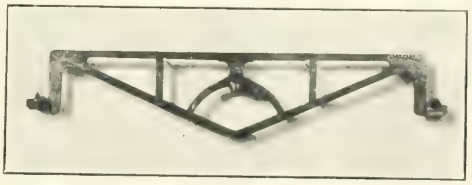


Fig. 2. Scale-Beam of an Analytical Balance, Indicating Application of Mixture for Scales.

Scale-Beams.

In the manufacture of fine analytical balances and bullion scales, as well as in other classes of similar instruments, a strong and stiff scale-beam is required. The requirements of these beams are that they shall be capable of supporting the load put upon the scale without bending, distortion or breakage. It is particularly essential that the elastic limit of a bronze used for this purpose shall be very

high so that the beam cannot be "set" by the maximum load. For such scale-beams, a bronze high in tin has been found the most satisfactory. For the finest kinds of analytical balances more tin can be employed than in the larger scales as the load is light. In this case a bronze that is actually brittle is employed.

There are practically two mixtures employed: That for fine analytical balances and small scales, and heavy beams for bullion balances:

Mixtures for Small Analytical Scale Beams

Copper	79 lbs.	or 790 grams
Tin	18 lbs.	or 180 grams
Zinc	2 lbs.	or 20 grams
Lead	1 lb.	or 10 grams
Total	100 lbs.	or 1000 grams

Mixture for Bullion Balance Beams

Copper	84 lbs.	or 840 grams
Tin	13 lbs.	or 130 grams
Zinc	2 lbs.	or 20 grams
Lead	1 lb.	or 10 grams
Total	100 lbs.	or 1000 grams

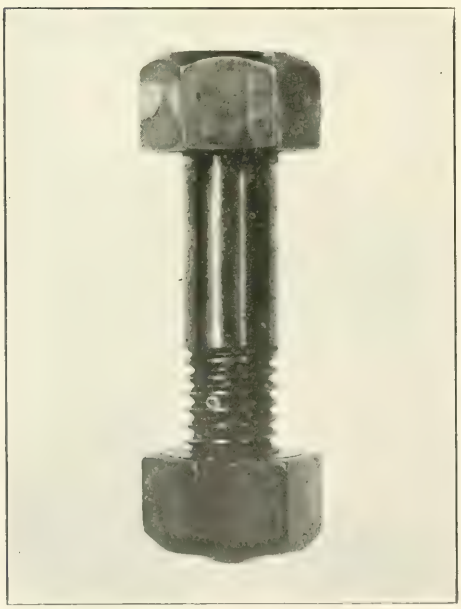


Fig. 3. Casting Made from Mixture for Bolts.

The small amount of lead is necessary for imparting good cutting qualities and ease in filing and finishing the beams. Good foundry practice is necessary in casting these mixtures in order to avoid unsoundness. If the mixture is melted twice it usually gives better castings than only one melt.

Bolts.

Cast bolts and nuts are quite extensively used in some classes of trade. Marine work consumes a considerable quantity and in the manufacture of paper, they are also employed. What is necessary for this class of work is a strong, tough bronze and the following mixture is quite suitable. It will stand considerable torsional strain and is the best mixture that can be used for the purpose:

Mixture for Bolts and Nuts

Copper	90 lbs.	or 900 grams
Tin	8 lbs.	or 80 grams
Zinc	2 lbs.	or 20 grams
Total	100 lbs.	or 1000 grams

Lead is preferably left out of the mixture for the reason that it weakens it. Bolts are frequently required to stand an enormous torsinal strain in tightening with a large wrench, and it is not infrequent to find fully as much expected of them in this respect as a steel or iron one. On this account, it is advisable to use no lead in the mixture.

Marine-Hardware.

While much of the hardware used for marine work is made of yellow brass, there is a demand for a better class manufactured from red metal. The requirements for this class of work are not at all severe and about

Fig. 4. Marine-Hardware Casting.

all that is expected is that a good, red mixture shall be employed. Ordinary "composition" is usually employed, but this contains too much lead for good work. Lead has the property, when present in any considerable amount, of causing the bronze to corrode in

sea-water or fresh-water, and for this reason it is always advisable to keep the quantity down to a small percentage; just enough to impart free cutting qualities. The following mixture is one that will give a high grade marine-hardware casting and one that will stand sea-water well:

Marine Hardware Mixture

Copper	88 lbs.	or 850 grams
Tin	5 lbs.	or 50 grams
Zinc	5 lbs.	or 50 grams
Lead	2 lbs.	or 20 grams
Total	100 lbs.	or 1000 grams

For cheap, marine hardware, ordinary "composition" as described in THE BRASS WORLD, February, page 47 is suitable, but is not as strong as the foregoing mixture, and it will also corrode and pit more rapidly.

(To Be Continued)

Pure Nigerian Tin.

In the *Transactions of the Faraday Society*, Nov. 1911, page 134, G. T. Holloway relates his experience with a kind of tin not generally known. He says:

"About ten years ago, I received from Nigeria some metallic tin made by the natives from extremely pure alluvial tin ore, and smelted by them with wood charcoal under conditions where, although smelting was extremely crude, and the losses were heavy, the introduction of impurities was practically impossible.

The tin was run by the natives into straws or reeds, and the bars I had made from it formed the purest tin which I have ever examined. The highest grade tin which I had previously obtained and had used as a standard for analytical purposes, was found upon assay to be about 0.2 per-cent less pure than the Nigerian tin, in which I have been unable to find any impurity except a trace of iron.

This special Nigerian tin is now used by a large number of metallurgists as their standard of purity, and it would be interesting to see whether "sickening"* could take place in such metal. It is quite probable that it would not."

*See the BRASS WORLD, March 1912, page 96 for description of this 'sickening" or disintegration of metallic tin.

An Investigation of the Strength of Rolled Zinc.*

By Herbert F. Moore.

Uses of Zinc.—Zinc is used as a constituent of brass and other alloys, as a protective coating for iron and steel plate and pipe, and as a preventative against rusting out of steam boiler tubes. It is used for making fruit jar covers and corrosion-resisting cans and boxes. In the form of wire, it is used for making shoe nails, and in the form of plates, it is used for making etchings (line cuts) for the repro-

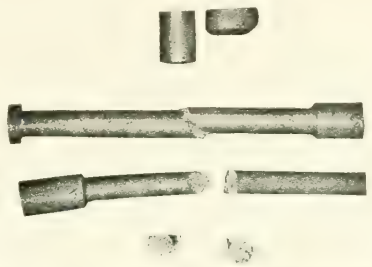


Fig. 1. Zinc Test-Bars of Cast Metal Showing Appearance After Breaking.

duction of drawings. Zinc has a wide use as the electro-negative element in electric batteries. The ductility of zinc is an important factor in the manufacture of fruit jar covers, cans, battery zincs, or in other cases when it is to be bent or stamped into shape. Zinc is rarely used as a stress-carrying member of a machine or structure; in Europe thin zinc plates are sometimes used for roofing, and in a few cases electric cables have been suspended by strips of sheet zinc, which resist atmospheric corrosion better than do strips of steel plate.

Purpose of Investigation and Acknowledgment.—The occasional use of sheet zinc hangers for supporting electric cables called the attention of the Matthiessen and Hegeler Zinc Company of La Salle, Illinois, to the question of the strength of rolled sheet zinc, and it was found that little data was available. The matter was referred to the attention of the Engineering Experiment Station of the University of Illinois, and the general subject of the strength of rolled zinc seemed to be of

*Abstract from Bulletin No. 52 issued by the Engineering Experiment Station of the University of Illinois, Urbana, Ill.

sufficient importance to warrant making tests. A series of tests of strength of zinc was made in the Laboratory of Applied Mechanics of the University of Illinois, by the writer, under the general direction of Professor Arthur N. Talbot, head of the Department of Theoretical and Applied Mechanics.

In addition to tension tests of zinc, tests of rolled zinc under punching and shearing were made. In the course of the investigation, several tests of cast zinc were made, including torsion and compression tests, and also cold bending tests of rolled zinc. The results of all these tests are recorded in this bulletin.

Existing Data on the Strength of Rolled Zinc.—The principal tests on the strength of rolled zinc have been made by Bauschinger, Martens, and Meyer. Bauschinger's tests showed the effect of rapidity of loading on the properties of zinc. The influence of duration of test on the strength of cast zinc was slight, but with rolled zinc, rapidity of testing increased the tensile strength. In tests lasting 6 min., the average ultimate tensile strength was 29,100 lb. per sq. in.; in tests lasting 81 min., the average ultimate tensile strength of 23,300 lbs. per sq. in.

Marten's investigations on the strength of zinc dealt with the influence on strength of thickness of plate, of direction of rolling and of temperature. From these results, it would seem that about 300° F. is the most favorable rolling temperature for zinc plates, as at that temperature the strength is low and the ductility at a maximum. All Marten's tests were made on zinc refined from Silesian ores.

An exhaustive series of tests of the strength of zinc plates was made by Dr. Oswald Meyer of Vienna. These plates tested by him were rolled at the zinc works at Cilli, Austria. The plates contained the following:

Zinc	99.929% to 98.000%
Lead	0.021% to 1.040%
Cadmium	0.030% to 0.912%
Iron	0.020% to 0.030%
Copper	trace to 0.009%
Arsenic	trace trace

The following results of Meyer are of interest:

1. The ductility of specimens cut with the grain is greater than cross-grained specimens.

2. The yield-point is not sharply marked and the flow of metal under stress goes on for a long time.

3. Tests of zinc plates treated with nitric acid show that a 10 minute immersion in 5% nitric acid did not appreciably lessen the strength of the zinc.

4. Specimens subjected to 1 hour at 527° F. indicated that the strength and ductility are decidedly lowered by this treatment. The "critical" temperature of zinc was found to be about 300° F. and the heat of transformation of the zinc took place very rapidly, one minute being sufficient to effect it. The tests of Martens and Meyer point to the desirability of keeping the working temperature during the rolling of zinc within narrow limits. Meyer recommends 302° F. as a maximum rolling temperature.

Effect of Cadmium and Lead. Meyer also made tests to show the effect of cadmium and lead. He found that 0.2% of cadmium improved the quality of the zinc plate, but that the addition of 0.4% of either cadmium or lead, either produced no appreciable effect or injured the quality. The addition of both cadmium and lead lowered both the strength and durability.

The Matthiessen and Hegeler Zinc Company of La Salle, Illinois, report a series of tension tests of zinc plate made at their request in 1907. The thickness of the plate tested varied from 0.011 in. to 0.04 in., the average tensile strength for sixty specimens was 29370 lb. per sq. in. The thinner plate showed slightly greater strength than the thicker plate.

Source of Supply of Zinc for Tests.—The zinc tested at the University of Illinois came from the zinc works of the Matthiesson and Hegeler Zinc Company at La Salle, Illinois, and from the stock of a local hardware store. The zinc from the Matthiessen and Hegeler Company was smelted from ores from the Joplin, Missouri, district. Several specimens of cast zinc were furnished which were remelted spelter poured directly into moulds. Eighteen sheets of rolled zinc, each 18 in. by 20 in., were furnished, varying in thickness from 0.006 in. to 1.0 in. Three sheets of each thickness were furnished, and each of the three sheets was from a different heat. No special precautions as to heat treatment were taken either with the cast zinc or with the rolled zinc. As a check on the values obtained for the zinc plates furnished by the Matthiessen and Hegeler Zinc Co., tests were made on

sheet zinc purchased in the local market (Champaign, Illinois).

Results and Conclusions.

Tensile Strength of Zinc.—An examination of the results of tension tests shows that zinc, either cast or rolled, is imperfectly elastic under very low stresses. The results of Meyer's tests are in agreement with the results of the Illinois tests as regards this general conclusion, though in the Illinois tests permanent set was detected at lower stresses than in Meyer's tests. Whether the elastic limit be defined as the lowest stress under which a material is given a permanent set, or as the lowest stress at which Hooke's law (proportionality of stress to deformation) is found to be inexact, the elastic limit of zinc is very low and very poorly defined. It is doubtful if the elastic limit as determined either by Meyer or in the Illinois tests has any special physical significance. Though Meyer reported a yield point of zinc in the tables of results of his tests, in the accompanying discussion he stated that the yield point was poorly defined. In the Illinois tests no well-defined yield point could be detected, and none was reported.

The ultimate tensile strength of cast zinc depends on the temperature of pouring, and other factors, and varies between wide limits. Thin plates of rolled zinc are relatively stronger under tension than thick plates. From the results of the Illinois tests for plates under 0.05 in. thick, 24,000 lb. per sq. in. would seem to be about the value to be used for the ultimate tensile strength of rolled zinc. For plates over 0.05 in. thick, 21,000 lb. per sq. in. would seem a reasonable value to use. Meyer's tests and those of the Matthiessen and Hegeler Zinc Company show slightly higher values. Rolled zinc is somewhat stronger in tension across the grain than in tension with the grain. A higher tensile strength of rolled zinc was obtained by increasing the rapidity of application of load. Rapidity of testing may, in part, account for the fact that higher values of tensile strength were found by Meyer and by Matthiessen and Hegeler than were found at Illinois. Neither of the first two reports the speed of testing. The speed used in the Illinois tests was lower than is sometimes used in commercial testing.

From the results of the various tension tests of zinc herein quoted, it would seem that the modulus of elasticity of zinc is about 11,500,000 lb. per sq. in.

Ductility and Plasticity of Zinc.—For the comparison of the ductility of different metals there is, unfortunately, no well-defined quantitative standard. In the series of tests described in this bulletin the elongation and the reduction of area after rupture in tension and the results of cold bending tests were all used to throw light on the ductility of the zinc tested. From the results of the tests, it is evident that zinc is much less ductile than wrought-iron or mild steel, and that it is less ductile across the grain than with the grain.

Fig. 2. Test-Bars of Zinc Sheet After Breaking.

For zinc plate which is to be stamped or bent into shape (for example in the making of zinc elements for dry batteries), a severe cold-bending test would seem to be of considerable value in determining the acceptability of a shipment of zinc plate.

The researches of Martens and of Meyer on the effect of heat treatment of zinc on its strength and ductility would indicate the desirability of measuring and of controlling the temperature in the rolling process and show the danger of rolling at too high a temperature. While the ductility of zinc is low as compared with that of steel, from the low and poorly defined elastic limit, from the loss of energy in "mechanical hysteresis" and from the behavior of compression test pieces it is evident that the zinc possesses a relatively high degree of plasticity.

Summary:—The following summary is given:

1. Zinc either rolled or cast has no well-defined yield point and its elastic limit is very low. Zinc possesses a relatively high degree of plasticity.

2. The ultimate strength of thin rolled zinc plate (not more than 0.05 in. thick) is about 24,000 lb. per sq. in.

3. The modulus of elasticity of zinc in tension is about 11,500,000 lb. per sq. in.

4. The stress per square inch of area sheared developed in punching or shearing rolled zinc plates, is about 40 per cent of the stress developed in punching or shearing mild steel plates.

5. The energy per square inch of area sheared per inch thickness of plate required to punch or shear rolled zinc plates is about 30 per cent of the energy required to punch or shear mild steel plates.

6. The ductility of rolled zinc is much less than that of mild steel, and the ductility of zinc plate with the grain is greater than the ductility across the grain.

An Improvement in Detinning.

According to a patent recently issued to Joseph Weber of Essen-on-the-Ruhr, Germany, the removal of tin from tin plate scrap and old tin cans can readily be accomplished by boiling in a caustic soda solution containing saltpeter. The use of saltpeter is the important portion of the invention and is new. It is stated that the removal of the tin is hastened and made far more complete than when only the caustic soda solution itself is used.

The tin scrap is first treated in a weak caustic soda solution to remove grease, dirt, food and varnish from the scrap or tin-cans. After this it is boiled for three hours in a solution containing 20 per-cent by weight of caustic soda and 10 per-cent of saltpeter. It is then removed and boiled for three hours in a second kettle containing the same amount of caustic soda and saltpeter.

The solution contains the tin as sodium stannate and is concentrated by evaporation until it has a specific gravity of 1.4 when crystals of sodium stannate form and may be removed. The mother liquor is used over again. The sodium stannate is converted into oxide of tin by precipitation with carbonate of soda, and then either dried and sold or smelted to metallic tin. The patent has been assigned to Th. Goldschmidt, well known as the owner of detinning processes.

The Use of Titanium for Purifying Aluminum.

It has been well established that aluminum, when melted, takes up nitrogen and carbon. The introduction of these elements greatly injures the aluminum and decreases its strength. This fact explains why aluminum that has been melted, even but a few times, is inferior to the new metal.

It has already been established that titanium has a very strong affinity for nitrogen, if not actually the strongest of any element, and also for carbon. When it is added to molten aluminum, therefore, it is but natural to expect that the nitrogen and carbon should be removed.

The use of titanium for purifying aluminum from nitrogen, carbon and other foreign elements has been patented by A. J. Rossi of The Titanium Alloy Co. of Niagara Falls, N. Y. (U. S. Patent 1,019,531, Mar. 5, 1912). Mr Rossi has spent many years in experimenting with the titanium alloys and the production of them and has made many interesting and valuable discoveries.

To purify the aluminum, an alloy of titanium and aluminum is preferably employed. This will contain a known quantity of titanium and the amount added can thus be regulated. The inventor states that the amount of titanium to be introduced should not be excessive, and should not leave over 0.5% in the aluminum. Probably much less will answer the purpose.

When the titanium is introduced into the aluminum for the purpose of purification, it combines with the nitrogen and carbon and forms titanium cyanonitrides which float to the top of the molten aluminum and may be skimmed off.

The use of titanium for purifying aluminum seems to be one of the marked advances that have been made in the metallurgy of the latter element. Previous to this time there was no method of purifying it, other than actual refining or smelting again in the electric furnace. By the use of titanium, therefore, it will be possible to do this in the crucible.

Iron is not magnetic when red hot, but becomes so when it falls to a black heat. On this account, iron cannot be removed from molten metals by means of a magnet.

Use of the Storage Battery in Electroplating.

By D. P. Orcutt.*

A number of electro-platers have found that a storage battery is a valuable addition to their equipment. One well-known and very successful silver depositor, Mr. William F. Hayes, of William F. Hayes & Company, Mount Vernon, N. Y., states that he has used storage batteries in electro-plating for over fifteen years and that he considers them a necessary part of his equipment.

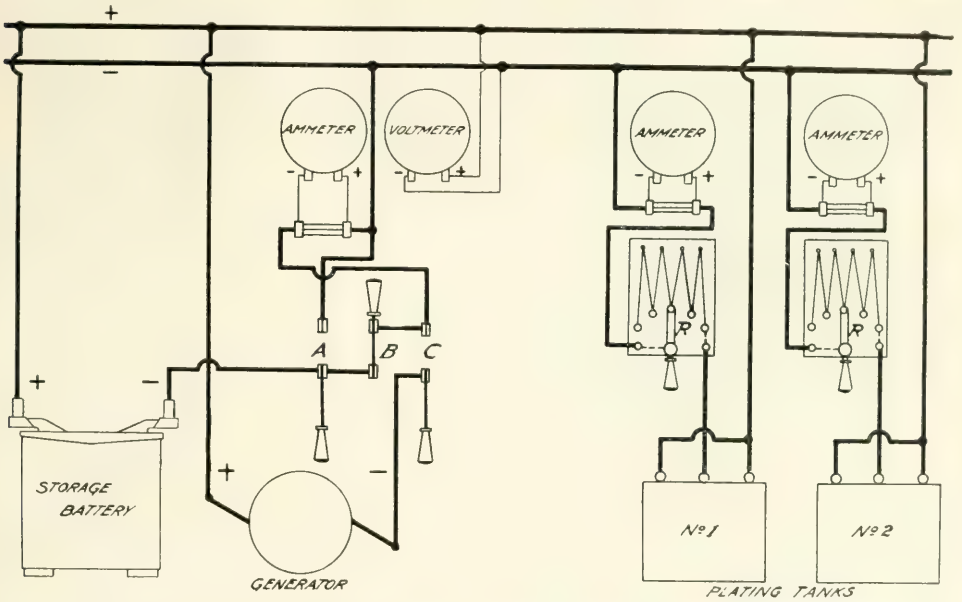


Fig. 1. Sketch Showing Method of Wiring and Placing Storage Batteries for Electroplating.

The diagram in Figure 1. shows the method of connecting the storage battery to the rest of the system, this method being varied, at times, to meet special conditions. While it is a great convenience to have an ammeter in the battery circuit, the arrangement of switches shown in Figure 1. makes it possible to determine, from the readings of the ordinary generator ammeter, the charge and discharge current of the battery, the total generator current and the current going to the plating tanks. With the switches in the positions shown, e. g., with switches "A" and "C" open and "B" closed, the generator is disconnected from the circuit and the plating is being done by the battery. The total discharge current of the battery is shown on the generator ammeter. When the generator is running, and the current from it is being used to charge the battery and to do plating at the same time, switch "B" would be open and switches "A" and "C" would be closed. The ammeter would then read the total generator current.

To determine the part of the total generator current being used at the plating tanks the switch "B" would be closed and "A" would be opened. The part of the current going to the battery would not then go through the meter and the meter would show only that being used in the tanks. The current being used in charging the battery would evidently be the difference between the total generator current and the current being used at the tanks, as determined above.

Mr. Hayes' method of operation is to run his generator at approximately full load during the day time, allowing the surplus current above that required for plating purposes, to charge the storage battery. By night the storage battery is charged and he shuts down the generator, re-adjusts his tank rheostats, goes home and leaves the storage battery to

*Electric Storage Battery Co., 100 Broadway, New York City.

continue the plating throughout the night. In this way he gets double service out of his tanks with small increase in labor cost.

In addition to this, the storage battery acts as a reserve at all times in case of generator trouble or failure of the power which operates the generator.

Another advantage of this method of operation is the fact that the battery floating across the generator as it does, tends to equalize any fluctuations in voltage, with the result that the current supplied to the tanks is steadier than

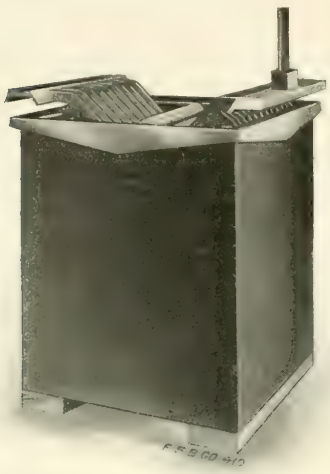


Fig. 2. Type of Storage Cell Used for Silver-Deposit Work.

where no battery is used. This results in a better class of work than is otherwise possible, Mr. Hayes' work being particularly noted for its uniformity.

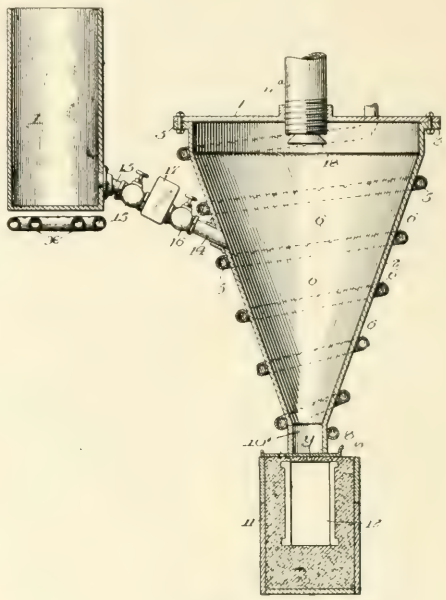
The type of storage battery used by Mr. Hayes is shown in Figure 2. This cell is known as a "Type G Chloride Accumulator" and is manufactured by The Electric Storage Battery Company of Philadelphia, Pa.

Mr. Hayes states that the cost of up-keep of such a cell in Electro-plating work is insignificant and that the first cost is low when the results obtained are considered.

Brass or bronze chips that have been briquetted in a briquetting machine so that a solid mass is produced, can be melted with practically as little loss as ingot metal.

A New Form of Die-Casting Apparatus.

A new apparatus for making die or pressure castings has been patented by Frank W. Tracy of Chicago, Ill. It is herewith illustrated and the method of casting a white metal bearing is shown.



Tracy's Apparatus for Die Casting.

The metal is melted in a pot 1 and is allowed to flow, by means of suitable valves shown in the connecting pipe, into the chamber. This chamber is surrounded by gas jets to keep it hot and prevent the chilling of the metal. The mold is connected to the bottom of this chamber.

The metal is allowed to flow into the chamber and is kept from flowing into the mold until pressure is applied by the choke plate 8. The valves in the inlet pipe are then closed and pressure applied at the top through the pipe in the chamber. This forces the metal into the mold. The absence of air bubbles in the castings is one of the principal features claimed for the apparatus.

Ceylon graphite is the only variety of this material that can be used in the manufacture of graphite crucibles.

Brass and Bronze Plating Solutions and How to Make Them.*

Fourth Paper.†

The Anodes.

It would naturally be expected that a brass or bronze solution should invariably be run with anodes of the same mixture of copper and zinc that is to be deposited. For example, if a green brass is desired, a brass anode containing 4 parts of copper and 1 part of zinc would have to be employed. Not only is this unnecessary, but nothing is to be gained by it. Were it possible to maintain the solution in even balance all the time, from the very beginning of the making of a new solution until it had outlived its usefulness, this practice would be right; but it cannot be done and it should be constantly borne in mind that the anodes in a brass solution never give off their metal so as to maintain this balance. Therefore, when anodes of the same mixture of copper and zinc that is to be deposited are used, unless the solution is constantly attended to and "built-up," the deposit will change in color. In working a brass solution (or bronze) the color of the deposit is invariably the "barometer" or indication of the condition of the bath and there is no other known method of ascertaining it. All additions, all replenishings or "building-up" are carried out with this in view, and when the color has been obtained that is satisfactory, then everything is right, provided, of course, it can be maintained for any length of time; then nothing more need be done.

There is no objection, however, to the use of brass or bronze anodes of the exact mixture that is to be deposited, but it is usually considered unnecessary and in practice but two kinds are generally employed: A yellow brass anode and a bronze anode.

The yellow brass anode almost exclusively employed is composed of 2 parts of copper and 1 part of zinc or approximately this proportion. This mixture contains 66 per-cent of copper and 34 per-cent of zinc. It is called "common-brass." The bronze anode is composed of 9 parts of copper and 1 part of zinc and contains, therefore, 90 per-cent of copper and 10 per-cent of zinc. These mixtures are used whether the anodes are cast or rolled.

There is one thing that must be taken into consideration in running a brass or bronze solution, and that is to have plenty of anodes so that a large amount of surface will be exposed. Cyanide does not attack a brass or bronze anode rapidly, and for this reason, the metal is not given off from them, when the deposition is going on, at the same rate that it is deposited. This fact, however, can be overcome to a considerable degree by the use of a large number of anodes so that the maximum amount of surface is exposed to the solution. There is nothing to be gained in economizing on anodes and when it is done, the solution must be replenished very frequently.

Cast and Rolled Anodes.

Unless special shapes are necessary, such as those frequently employed in plating barrels and plating machines, rolled brass or bronze anodes are to be preferred to those which have been cast. The rolled anode dissolves away, under the action of the current, very uniformly and without pitting so that when it has been used so long as to be of no further service, it will be found quite thin, thus reducing the waste to a minimum.

In the case of the cast anode, the action of the solution is not as even and there is apt to be pitting and uneven wasting away so that at the end the amount of scrap may be greater. It has been claimed that a cast anode, on account of its structure being coarser than that of the rolled anode, dissolves in the plating solution better, and this may be so although it is one of the things not thoroughly worked out. It may be said, however, that the rolled anode is much more extensively used and has the advantage of wearing away evenly.

The best results are obtained when the anodes are pure and composed only of copper and zinc. Lead is the principal impurity and there is a variety of rolled brass that is called "leaded brass" and used where free cutting is desired. This should *never* be used. The lead it contains is not dissolved by the cyanide in the solution, but remains on the surface as an insoluble coating and impedes the action of the current. The brass deposit is then apt to show varying colors. All brass contains a little lead and it is impossible to obtain it

*Continued from THE BRASS WORLD, March, 1912, page 95.

†These papers will be continued for a number of months.

without, but the variety known as "leaded brass," as previously mentioned, in which the lead is introduced intentionally should always be avoided. In such brass the lead may run as high as 2 or 3 per-cent, while in ordinary brass, in which the lead is not added intentionally, but is present as an impurity in the zinc, it should not go over half of one per cent.

Use of Copper Anodes.

The use of copper anodes in a brass or bronze solution is not new although many platers have never heard of it. It is excellent practice and one carried out by some of the best brass platers in the business. Upon first thought, it does not appear like good practice, but when it is borne in mind that brass anodes, even though they may be of the identical mixture that is to be deposited, never maintain the solution in the right condition, but from time to time, the addition of carbonates of copper and zinc must be made. The reason for this is the fact that the brass deposits more rapidly than it comes from the anodes. This constantly increases the amount of free cyanide in the solution, and to offset this, the carbonates must be added.

Copper is more soluble in cyanide than brass. Brass is more soluble in it than zinc. Hang a piece of sheet zinc as an anode in a brass solution and see how quickly it becomes covered with a white slime. The zinc in brass is the reason, therefore, why it does not dissolve in cyanide as readily as copper. This fact is easily demonstrated by placing a brass anode and a copper anode in a brass solution side by side. The brass will become more rapidly coated over than the copper. A copper anode, accordingly, will remain cleaner for a longer time than a brass one, and it is for this reason that they are used. They require much less attention and as they do not become coated readily, the current density remains uniform and the color of the deposit does not change.

The natural question is, when copper anodes are used in a brass or bronze solution: How is the zinc obtained? It is added to the solution, from time to time, as carbonate of zinc, whenever it is found necessary. The same thing has to be done when brass anodes are used, and in addition carbonate of copper, so that the addition of the two carbonates renders the "building-up" of the brass solution more difficult and uncertain than when carbonate of zinc only is used. When copper anodes are used, they require very little attention and need cleaning much less frequently than those of brass. There is but one thing, therefore, that must be done and that is to add carbonate of zinc when the color of the brass deposit indicates that it is needed. It will readily be understood that this fact greatly simplifies the working of a brass solution.

The use of copper anodes in a brass solution (and in bronze solutions equally as well) may be called modern practice and is to be highly recommended as it greatly simplifies its working and there is then less factor of uncertainty.

The advantages of the use of copper anodes in a brass solution may be summed up as follows:

1. The copper anode remains clean in the brass solution for a much longer time than a brass one.

2. There is but one ingredient to add to the brass solution when it needs replenishing and that is carbonate of zinc. The copper anode supplies all the copper that is required.

3. The copper anode feeds the solution with copper much better than a brass anode, as in the case the latter is used, both copper and zinc carbonates must be added to the solution from time to time, while no carbonate of copper is necessary when the copper anode is employed.

In conclusion it is suggested that those who have not tried copper anodes in a brass solution should do so as it is believed that very much less difficulty will be experienced in runing and maintaining it, and obtaining a uniform color on the brass deposit constantly.

Cleaning the Anodes.

One of the most important operations in maintaining a brass or bronze solution is the frequent cleaning of the anodes. This is particularly true when brass anodes are used, although it applies equally as well to brass, bronze or copper.

In the case of the coating over of anodes in general, it is a usual rule that there is too little free cyanide present, and it is equally true, of course, in the case of brass solutions: but if a sufficiently large amount of free cyanide is used to keep the brass anodes clean at all times, then other difficulties creep in, such as blistering and thinness of deposit. The anodes, therefore, will coat over after a time

when the right amount of free cyanide is present. It may be said, however, that when copper anodes are used, much less free cyanide is required to keep them clean and this, in addition to the other features serves to render the use of copper anodes very satisfactory.

As it is unsatisfactory to have so much free cyanide in a brass or bronze solution that the anodes never require attention in the matter of cleaning, they will gradually coat over. It is the coating over of the anodes that causes so much trouble in brass plating. If one is quite observing, he will find that as soon as the surface of the anode becomes coated with a slime, the deposit begins to change in color. Many platers have experienced the difficulty of a brass deposit of several different colors. When this is found, it will also be found, unless the current has been otherwise weakened, that the anodes are badly coated over. When this is the case, the current is impeded and it gradually becomes less and less. It is well known that to obtain a certain color of brass, a certain current density must be maintained. As the current weakens, the colors change until with a very weak current (obtained when the anodes are badly coated) only copper deposits.

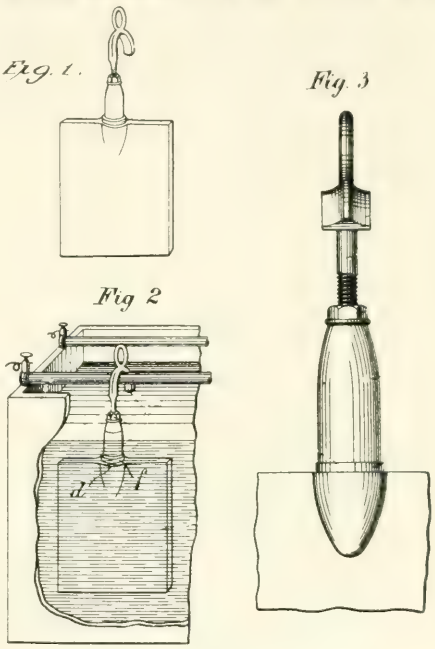
As a usual rule, when several different colors of brass deposit are obtained, and the anodes are very badly coated over, it indicates that more free cyanide is necessary so that the anodes will keep clean; but if the right amount of free cyanide is present and the anodes coat over only after some time, then scrubbing, scouring or dipping must be employed. The best method is to brush off the slime with a stiff brush and rinse them and then dip the anodes in an acid dip so that a bright surface is obtained. Even though the slime may be scrubbed off, there is usually a film of foreign material or skin on the metal, and unless this is removed, the anodes do not give off their metal freely.

When the anodes are kept bright and clean, the current passing through the solution remains uniform and the brass deposit likewise remains uniform in color. Unless the current density is maintained uniformly, it is impossible to maintain a uniform color on the brass deposit, and the cleaning of the anodes whenever necessary is the best insurance of the proper amount of current.

(To Be Continued.)

An Improved Anode Connection.

In electroplating, the anodes are either hung by S shaped hooks or by lugs on the anode itself or screwed in. In any of these instances the solution cuts through the rod at the top if it is immersed in the solution and allows the anode to fall. In order to offset this local action at the top of the anode



Improved Form of Anode Connection.

around the rods, it is customary to raise the anodes slightly out of the solution so that the rods are out of it. This leaves a butt-end of the anode as scrap.

A method for preventing this local action of the anode rod has been patented by Herbert E. Beach of Birmingham, England. The hook is made of brass, bronze or other metal and is screwed into the top of the anode. A rubber or fibre washer forms a seat on the top of the anode lug. Over this is a sleeve of rubber, wood or other non-conducting material which effectually insulates the anode rod.

The name "Argentine" is frequently used to designate finely divided tin or tin powder. It is used in making wall paper and printing upon fabrics and paper. It is made by precipitating a solution of tin chloride by zinc.

Standard Specifications for High-Brass Sheet.

The following specifications for high-brass sheet have been proposed by the Committee on Non-Ferrous Alloys of the American Society for Testing Materials:

Materials:—The alloy is to be composed of ingot copper and "brass special" spelter of a grade meeting the requirements of the specifications for pure metals adopted by the American Society for Testing Materials.

Proportions:—An average analysis must show not less than 64.5 per-cent of copper, and any individual coil showing less than 63.5 per-cent may be rejected.

as will combined produce properties equivalent to those possessed by the standard alloy of standard hardness. In the absence of any other specifications, soft brass will be furnished.

Surface:—The surface of the material shall be substantially free from scratches, spills, blisters, roll-marks, or undue stains, and shall be capable of being readily polished, except that in the case of soft brass, drawing or equivalent operations may be expected to render apparent the coarseness of the crystalline structure.

Dimensions:—The thickness may no. vary more than shown in the following table:

Thickness in Inches	(1)*	(2)*	(3)*	(4)*
.4600 to .3250	.0044	.0048	.0051	.0055
.3250 to .2040	.0039	.0043	.0046	.0055
.2040 to .1230	.0034	.0038	.0041	.0045
.1280 to .0640	.0029	.0033	.0036	.0040
.0640 to .0400	.0025	.0029	.0033	.0037
.0400 to .0201	.0020	.0024	.0028	.0032
.0201 to .0126	.0016	.0020	.0024	.0028
.0126 to .0080	.0013	.0017	.0020	.0024
.0080 to .0056	.0010	.0014	.0017	.0022
.0056 to .0040	.0008	.0012	.0015	.0019

*1. Up to 5 inches wide, inclusive. Variation either way.
*2. Over 5 inches wide to 8 inches, inclusive. Variation either way.
*3. Over 8 inches wide to 11 inches, inclusive. Variation either way.
*4. Over 11 inches wide to 14 inches, inclusive. Variation either way.

Impurities:—Lead must show not more than 0.50 per-cent; iron not more than 0.10 per-cent.

Heat Treatment and Temper:—Annealed brass is to be designated as light anneal or soft and shall be substantially uniform to the degree specified.

Unannealed brass shall be designated as hard, half-hard and quarter-hard, which designation shall correspond substantially to the following amounts of reduction by rolling from the final anneal:

Hard	35%
Half-Hard	20%
Quarter-Hard	10%

Except when otherwise agreed, the manufacturer can, on orders for unannealed brass, make such variation in mixture and hardness

Length, when ordered in 10 foot lengths:

40% May be 8 Feet or Over.
30% May be 6 Feet to 8 Feet
20% May be 4 Feet to 6 Feet
10% May be 2 Feet to 4 Feet

Not more than 40% of any one shipment will be less than 10 feet long.

When ordered in 8 foot lengths

30% May be 6 Feet or Over
20% May be 4 Feet to 6 Feet
10% May be 2 Feet to 4 Feet

Not more than 30% of any one shipment will be less than 8 feet long.

When ordered in 6 foot lengths:

20% May be 4 Feet or Over
10% May be 2 Feet to 4 Feet

Not more than 20% of any one shipment will be less than 6 feet.

Explanatory Notes.

These specifications are intended to cover standard high brass for general purposes, and which shall constitute a good delivery in the absence of specific information covering requirements.

1. While the material mentioned in the foregoing specifications is to be made of standard grades of raw material as indicated, it should be understood that cuttings, clippings and various other forms of material made from metals of the same grade as these indicated in the specification will be used in connection with the same.

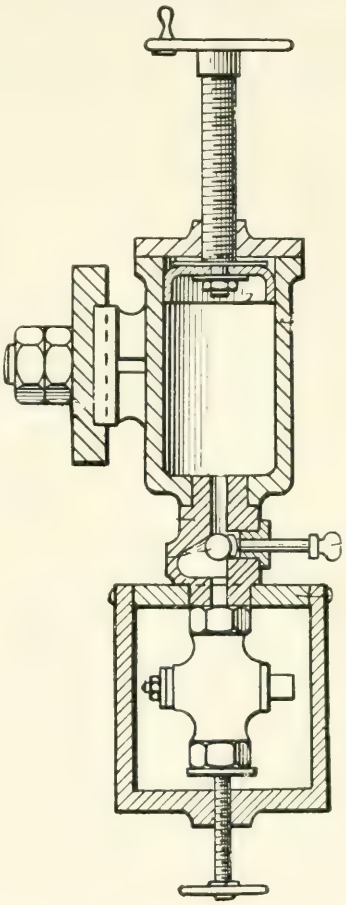
2. The limits given the table on dimensions cover the entire gauge variation which will be allowed and includes that to be found from center to the edge of the strip as well as that occurring throughout the length of the strip and between different coils or strips in the same lot.

Use of Water-Glass for Stopping the Leaks in Valve Castings.

One of the principal difficulties in the manufacture of valves and other work to stand pressure is the fact that many of the castings leak under pressure when tested. This leakage may run from 5 to 25 per-cent. In the very best practice, the leakage is never less than 5 per-cent, and in establishments where ordinary practice only is carried on it may run from 10 to 15 per-cent and still not be called extraordinary. Even in the establishments in which the best methods are practiced, it is impossible to keep the loss from leakages less than 5 per-cent. This, of course, is on a long run and not on individual heats or days work.

Various methods have been tried to prevent this waste from leakage, but so far it has not met with much success. With small valves, the matter is not of much importance, but as they increase in size, the subject becomes serious and when large pump cylinders are taken into consideration, it frequently becomes almost imperative to find some way of overcoming the leakage. It has been found impossible, however, to do any better with the foundry practice as it exists to-day, and as a last resort, attempts have been made to obtain some salvage from the leaky castings in order that they all will not have to go back to the melting pot.

In the case of iron castings, it has been found possible by filling the interior with a solution of sal-ammoniac and allowing the



Apparatus for Stopping Leaks in Valve Castings by Means of Water-Glass.

valve to stand for some time, to fill the pores up so that the casting will stand the necessary pressure. The sal-ammoniac solution simply rusts the metal around the pores so that they really become filled with iron-rust. This method, however, has not been used on bronze or brass castings as it does not work. The metal does not rust easily enough. Hot paraffine has also been tried, but this does not answer the purpose at all well. Subsequent heat is apt to remove the paraffine from the pores and allow the castings to leak again.

A method of stopping the leaks in valve castings has recently been patented in the United States* and is of much interest. It makes use of water-glass (silicate of soda) for stopping the leaks, but this is not the feature of the patent and the material, of course, can be used by anyone. The patent is on the apparatus for forcing the water-glass into the pores of the casting.

The apparatus is shown in the sketch accompanying this article and is simply an appliance for applying pressure to the inside of the valve casting to be treated and forcing it into the pores. The valve is held in a clamp inside of a chamber containing the solution of water-glass. The appliance is made so that when tilted, the water-glass will flow inside of the valve. Pressure is then applied and the water-glass is forced into the pores of the casting. The apparatus is then turned upside down and the water-glass flows out of the valve and is ready for use again. If any of the water-glass is forced through to the outside of the valve casting, it is simply wiped off.

The water-glass dries and hardens quickly upon exposure to the air and effectually stops the leaks. While the apparatus is intended for continuous working, it is possible to use the water-glass in any other manner. It can be placed inside of the valve and pressure applied in any manner desired. It does not work in the desired manner unless pressure is applied.

The use of water-glass for stopping the leaks in valve castings and other castings to stand pressure is worthy of note and the accompanying patent has no bearing upon its use. It is upon a special form of apparatus for forcing the material into the pores of the valve-casting.

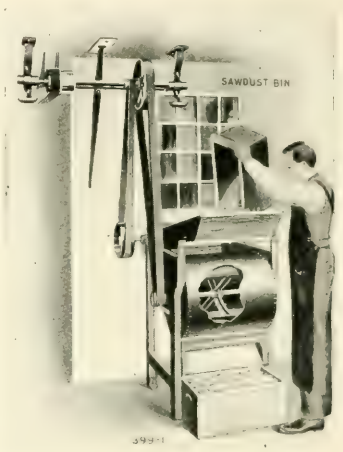
Aluminum absorbs nitrogen from the air when it is melted. This fact may be noticed by wetting some aluminum skimmings with water and allowing them to stand. Ammonia will be given off as the source of the nitrogen for forming the ammonia is from the aluminum.

*No. 1,019,532, Mar. 5th, 1912, by Sali Salm of Cologne Ehrenfeld, Germany.

The "Baird" Fanning Mill for Removing Sawdust from Small Metal Work.

In the making of small metal goods, it is usually necessary to use sawdust in some part of the operation. The goods may have to be tumbled in it for brightening or cleaning them; or they may be dried in sawdust. In any instances of this kind where sawdust is used in the manufacture of such small metal goods, it is necessary to separate the sawdust after the operation is completed.

The hand riddle is generally employed for removing sawdust, in a small way, but the operation is unsatisfactory for the reason that it is difficult completely to remove the saw-



The "Baird" Fanning Mill for Removing Sawdust from Small Metal Goods.

dust adhering to the surface of the goods. A machine for removing the sawdust by a fanning process has been manufactured by the Baird Machine Co., of Bridgeport, Conn., for some time. This appliance is known as the "Baird Fanning Mill" and is herewith illustrated.

To operate the machine, the goods mixed with the sawdust are placed in the hopper in the top. A vibrator shaft at the back automatically feeds the work into the air passage, and while the goods are tumbling down, an air current picks up all sawdust and blows it back into a barrel or bin where it is retained to be used over again. The goods, now free from sawdust, continue downward along the passage and fall into a box at the bottom. The

separation is very much faster than that obtained by hand riddling and is far more effective. The goods are obtained much cleaner.

Another use for the mill is in the separating of chips from screws and similar work.

Use in the Scrap Metal Trade

Fanning mills are frequently found useful in the scrap metal trades in separating sawdust from various kinds of scrap. It is not infrequent to find a fanning mill in scrap metal establishments and it pays for itself in a short time if certain kinds of scrap material are to be treated. Such a class of material are the copper and mica chips that are produced in large quantities in turning off the armatures of motors and dynamos. The fanning mill rapidly and effectually removes the mica and leaves the copper chips clean and bright so that they command a high price, and are classed as light copper scrap. Before removing the mica, however, they bring only the price of copper bearing material and have to be sold to copper smelters.

Nickel Plating Cutlery Before Silver Plating.

The question is frequently brought up: Is it good practice to first nickel plate steel knives and forks before silver plating, or to simply deposit the silver directly on the steel? This matter has been brought up several times before and has not been satisfactorily settled.

There are between twenty-five and thirty manufacturers of silver plated steel cutlery in this country. As far as known, there are but three of them that nickel plate their cutlery before silver plating. The rest deposit the silver directly upon the steel. It is also a significant fact that many of the large makers at one time nickel plated their cutlery before silver plating, but have now abandoned the practice and are silver plating directly upon the steel.

The whole question of plating steel cutlery lies in the adherence of the silver deposit. If it peels, while in use, when it has first been nickel plated and then silvered, and not when silver plated directly on the steel, then there is no question as to the superiority of the method of silvering directly upon the steel; but if the cutlery that has been first nickel plated and then silvered stands better than that which has not been nickeled, then the problem is solved as far as this plating modification is concerned. In order to solve this problem, however, it is necessary to consider a sufficient quantity of cutlery so that no individual instances will prejudice the case, and this can be solved only by the test of time. It would be unfair to both cases to attempt to form an idea from one maker's goods or from individual instances.

At the present time, the question seems to have resolved itself into this. There is no evidence to prove that nickel plating steel cutlery before silver plating produces any better goods, or that it will wear any better. Neither is there any evidence that the silver plated goods, with the silver deposited directly upon the steel, wears better than the nickel and silver plated cutlery. The matter really stands unsolved.

There is one thing in favor of silver plating directly upon the steel and that is that the largest concerns all use this method. Those who manufacture the steel cutlery that is nickel plated first are comparatively smaller manufacturers. They claim that the goods wear longer when first nickel plated.

The question is one that would require much experimenting to solve it, but at the present time the evidence is on the side of the manufacturers who silver plate the steel directly without the use of any nickel deposit. It is a noteworthy fact that many of these large manufacturers who now silver plate the steel directly, at one time nickel plated their cutlery previous to silver plating, but afterwards abandoned it.

When silver anodes turn black in the solution it usually indicates that impurities are present in the silver. The silver is dissolved by the cyanide, leaving those metals which are insoluble as a black slime on the surface. Copper is dissolved with the silver, but lead, arsenic, antimony and other metals are not. In addition to this cause of black anodes, current density that is too high will also produce a coating of peroxide of silver on them and this is likewise black. It disappears instantly, however, when the current ceases. It is possible, therefore, immediately to ascertain if this is the cause.

Standard Methods of Sampling Brass, Bronze, Aluminum, Steel, Iron and Foundry Materials.*

The questions that usually confront a person desiring to submit a sample to a laboratory for analysis or physical test are—What form shall the sample take? How shall it be selected? It is the purpose of this pamphlet to supply, in a general way, such information.

Method for Sampling Steel

The Iron and Steel Committee of the Society of Automobile Engineers make the following recommendations:

Material to be sampled shall be considered under three classes, namely:

1. Wire, tubing, sheet and rod metal less than 1¾ inches in size, shall be sampled across or through the entire section.

2. Forgings or pieces of irregular shape shall be sampled by drilling or cutting at thickest and thinnest sections, or through or across entire section. (In drop forgings, changes of carbon may be looked for in the outer ⅛ in. of metal).

3. Bars and billets or other shapes above 1¼ inches thick, shall be drilled at half radius, or half-way between center and exterior surfaces.

One to two ounces of clean drillings or chips, free from oil, grease, soap, dirt or other foreign material is a sufficient quantity for the usual steel analysis. If facilities for drilling the sample are not at hand, a piece of the material may be submitted to the labroratory, but the piece, if possible, should be of such shape and size as to permit of drilling or otherwise tooling.

Brasses, Bronzes, Aluminum Alloys Etc.

In general, the methods recommended for sampling steel may be applied to the copper, aluminum and other alloys. Care should be exercised when sampling castings to see that flaws, blow-holes or other defects are avoided. Above all, the chips should be kept free from iron drillings, dirt, oil or any foreign substance. One-half ounce of clean chips is a sufficient quantity for the sample.

The best practice in sampling brass and bronze chips of more or less varying composition, is to melt in a crucible or furnace from 100 to 200 lbs. of the chips, endeavoring to select an average sample. Cast the resulting metal into ingots and drill, sending the laboratory one-half to one ounce of the drillings. Carefully clean the drill before using and guard against admixture of iron or steel chips during the drilling.

Pig Iron

From six to twelve representative pigs should be selected from different parts of each car-load and fractured. Clean drillings should be taken from each fresh fracture of the pigs and carefully mixed, then quartered down and one to two ounces submitted to the laboratory. Do not take all the drillings from one section of the pig. Drill different sections, center, outside and midway.

Iron Castings

Take one to two ounces of drillings from a section of average thickness where possible. Throw away the outside skin or scale, and be very careful to avoid including sand in the sample.

Coal and Coke

Select from one-half to one bushel of lumps from all parts of the pile or car. If the shipment is not uniform in character, select the various kinds in about the proportion they occur. These lumps should be broken to about the size of a walnut and the sample quartered down until from four to eight quarts remain, which may be submitted to the laboratory for analysis or test.

Lubricating and Cutting Oils

The oil should be agitated in the barrel or container before the sample is drawn. One-half pint is usually sufficient for the laboratory. Do not put the oil in a wet or dirty bottle.

*Abstract of a pamphlet entitled "Notes and Useful Data on the Selection and Preparation of Samples for Analysis and Test," issued by the Henry Souther Engineering Corporation, Hartford, Conn.

In a patent issued to W. Keep in 1882 (British Patent, 5,854) the addition of cadmium to German-silver is claimed. It is stated that the whiteness of the alloy is improved and in this respect it is superior to ordinary German-silver. About 5 per-cent of cadmium is used to replace the same amount of zinc in the mixture.

A New Process of Making Table Cutlery.

A new process of making table cutlery has been patented by Patrick W. Powers of Northhampton, Mass. (U. S. Patent, 1,020,-158). The process has been devised in order to allow a more extensive embossing to be put upon the handle than can be done in the usual manner.

The usual method of making a steel knife is to forge out of a rod of steel that can be hardened. The handle is then embossed by dies, but the natural hardness of the steel does not allow extensive embossing and the dies

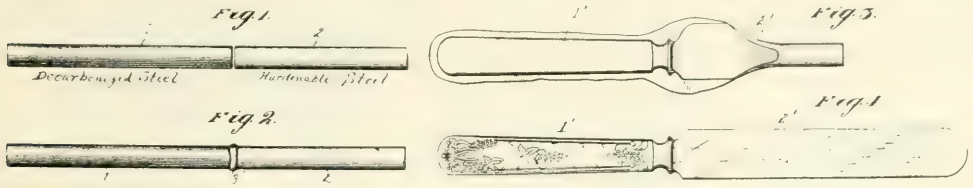


Illustration Showing the Various Steps in Making the Steel Knife.

themselves suffer. In the present invention the knife is made of two pieces of steel. The blade is composed of the usual steel that can be hardened, while the handle is made of the softest kind of steel. The two blanks are electrically welded as shown in the illustration. The knife is then made, ground and hardened in the usual manner. The embossing is then done upon the handle, but on account of being soft, it takes a much better impression than a harder steel would do, and is also easier upon the dies.

Melting Brass in Crucibles in England.

At a meeting of the London branch of the British Foundrymen's Association on February 9, Mr. J. Edwards, of the Royal Arsenal, Woolwich, delivered a lecture on "Brass, its Manufacture and Practical Applications," which, for the most part, consisted of hints on workshop economics. He strongly advised, wherever possible, purchase of materials by specification, and emphasised the necessity for chemical analysis being definitely established in the brass foundry, and especially where strip is concerned. Care in fuel consumption was necessary. This was, he said, largely dependent upon the space between the crucible and the walls of the furnace, and whether or not the contour of the furnace was something like that of the crucible, a space of two inches all round was about right. The economy in fuel under these conditions was very marked, compared with a square furnace. There was a tendency for the crucible furnace to wear away for about six inches at the bottom, due to the higher temperature there, but the life could be considerably prolonged if a patching mixture was made up of one part of old firebricks, two parts of old crucibles, and two parts of fire-clay. If this were broken up, ground, wetted, and worked up into a thick mixture and applied to the burnt portion of the furnace, it was possible to keep the latter in almost as good condition as when new.

For his 70-30 strip he used charges of 330 lb., consisting of copper 130 lb., zinc 68 lb., and brass cuttings 132 lb. As a flux he used 1 ounce of borax, 2 ounces of salt, and 12 ounces of charcoal. This had the effect of reducing the zinc oxide and preventing the zinc being vaporised off. Incidentally he strongly advocated large charges as against small ones. A very large proportion of the work at Woolwich was cast in chills, which, generally speaking, were cheapest, and the method of preparation was to rub lard oil in with a rag and then sprinkle a little finely-powdered plumbago over it. This gave a good surface, and produced a clean-faced casting which would not be likely to give any blemishes when the material came to be rolled. He favored a fairly long flue to the furnace, as this took up a considerable deposit of zinc oxide which gave a good return for the trouble of scraping it off, and which would otherwise be lost. It had quite a good value for making paint. Coke used in furnaces should not have a larger percentage of ash than 5 per cent. Such a coke with low sulphur was the material most suitable for melting with either cupola or pot-fire.

In the discussion Mr. A. Willis, after referring to the fact that the bulk of London brass

work was done under conditions very different from those suggested by Mr. Edwards and that the best results had to be got from unknown materials, said he had learnt from experience that salt in a flux was bad for two reasons. First, that it cut the walls of the crucible and reduced the number of heats, and, secondly, that it generated chlorine gas, which was bad for the health. He preferred to use glass, which, when placed at the bottom of the pot, was brought through as a slag on the top and did all that borax and charcoal could possibly do without acting on the pot like salt. The next speaker, Mr. Dean, however, disagreed with this view, and maintained that glass attacked the pot worse than salt.

Mr. W. Ellis asked if the lecturer could explain the existence of laminations.

Mr. C. Nash referred to impurities in the copper of scrapped locomotive fireboxes, which nowadays contained from 0.25 to 0.5 per cent. of arsenic. Would this have a deleterious effect in making 70-30 or 60-40 brass. Also would 70-30 brass be a suitable material for brazing steel pipes, as ordinary brazing material had not been found satisfactory for superheater tubes. Mr. Willis also referred to a black oxide in the copper of old fireboxes, which he attributed to the presence of arsenic, and he had now discarded it altogether.

Mr. Pemberton said it was not necessary to add borax and salt if the metal was covered with charcoal. He had found a little green fluorspar acted equally well.

Mr. Edwards, in his reply, disagreed that salt injured the pot; it was not there long enough. For ordinary foundry work, however, he did not use a flux at all; he first covered the crucible with a little coke-dust. Laminations in plate castings were generally due either to occluded slaggy matter or a sort of overlap resulting from too slow pour. He thought it probable that 70-30 brass would not do for brazing. In the question of large *v.* small pots, he said, he got 20 cwt. 2 qr. 2 lb. per one man's work per day with a 330-lb. charge and only 14 cwt. 1 qr. 14 lb. with a 115-lb. charge. The amount of coke used was less and the metal more.—*The Ironmonger.*

It is neither economical nor satisfactory to use a plating dynamo of too high voltage. The voltage should be adapted for the work to be done and so that it will not have to be reduced.

Bakelite and Some of Its Uses.

Bakelite is the invention of Dr. L. H. Baekeland, the well known inventor of velox-paper, now so extensively used in photography. It is a substance which, in its different forms, has the advantages of hard-rubber, Japanese-lacquer, celluloid, and in some respects is superior to these products. It is made from carbolic acid and formaldehyde. It is a singular fact that, while both of the materials from

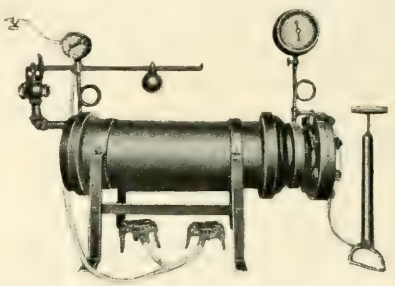


Fig. 1. A "Bakelizer" for Heating the Bakelite.

which it is made, are strong smelling and pungent substances, the resulting product of "Bakelite," is an amber-like material devoid of odor and taste.

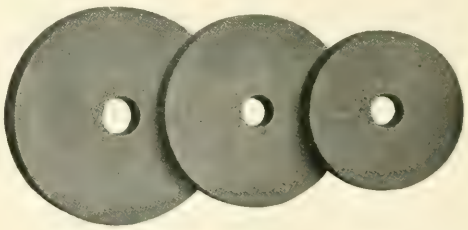


Fig. 2. Valve Discs Made of Bakelite.

There are three different kinds of Bakelite that can be made and which are designated as "A," "B," and "C." The "A" grade is the first product and may be either liquid, pasty or solid. It is soluble in alcohol, acetone or caustic soda. By the action of heat it is transformed into the "B" and "C" grades. After it has been changed to the other grades, it becomes very resisting. The "C" grade, for example is infusible unless actually decomposed, and will stand a heat of 572° F. (300°C.) without decomposition. It is also insoluble in all solvents and can withstand

strong chemicals, hot-water, steam, etc. During the hardening process of change from one grade to another higher grade, there is a shrinkage of two per-cent. This shrinkage, however, can be lessened by the use of filling materials.

The method of converting the grade "A" Bakelite into the "B" and "C" grades is by means of an apparatus called a "Bakelizer" and which is shown in Fig. 1. This is a retort made of steel or wrought iron and constructed to stand pressure. A small experimental

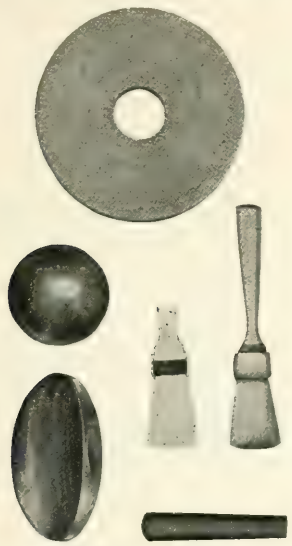


Fig. 3. Application of Bakelite in the Manufacture of Commercial Articles.

"Bakelizer" may be made of iron pipe and pipe fittings and that shown in Fig. 1 was made in this manner. While a simple heating will change the "A" to other grades, gas is given off which renders the articles made from them porous. By the use of the "Bakelizer" for heating the articles under pressure, the gas is prevented from escaping under pressure and the porosity of the article avoided. In this pressure apparatus the heating is carried out at about 284 to 356 degrees F. (140 to 180 degrees C.). The higher the temperature, however, the more rapid will be the change to the "C" grade. In connection with this "Bakelizer," it should be noted that the apparatus is steam-jacketed and uniform heating is obtained by this means.

The various grades of Bakelite are now made in a very large variety of articles and the list of uses is constantly increasing. A description of the grades and uses is as follows:

The liquid Bakelite "A" is one of the initial stages of the raw material made by uniting carbolic acid (phenol) and formaldehyde. It has the consistency of oil and can be used to impregnate paper, wood, plaster of Paris and other porous bodies. It can also be made thicker by heating it on a water bath for a few hours at 158° F. It then becomes pasty.

The "Bakelite" solid "A" is the next condition of this material and it melts upon the application of heat. In this condition it is molded and transformed into the "B" and "C" grades.

The bakelite is made in all colors from the natural amber to jet black. The colors are obtained by the admixture of pigments. Bake-

Fig. 4. Additional Articles Made of Bakelite.

lite lacquer is one of the products and it has a pleasing golden color. Darker tints are obtained by heating it to a higher temperature. The lightest coats are obtained by the use of the thinnest possible amount of lacquer, just short of iridescence. The lacquer can be dried at ordinary temperatures, but if baked it becomes harder and more resisting. Unless applied in a very thin coating, however, it

lacks the flexibility of the nitrocellulose lacquers, but partakes more of the character of the shellac lacquers. It is, however, very resisting.

Bakelite enamels are now being made to take the place of japans and are applied and then baked in the same manner.

One of the largest applications of Bakelite is in the manufacture of electrical goods and it has proved to be one of the best insulators. For this purpose the grade "C" is used. Numerous other applications have also been made, some of which are illustrated in Figs. 2, 3 and 4.

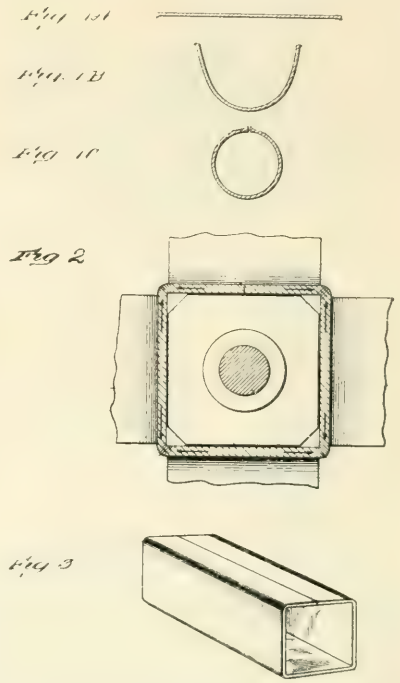
In Fig. 2 are shown valve discs that can be used in steam valves and in plumbers' goods. One of the advantages of Bakelite is that it can be mixed with asbestos or other fibrous material for special purposes and which renders it very tough and resisting. In Fig. 3 is shown a variety of goods. Grinding wheels (shown at top) are made by impregnating Bakelite with an abrasive. Billiard balls are also manufactured, while knife-handles have been found another important outlet. Brush backs have likewise proved satisfactory. For making other kinds of brushes, it has been found applicable for holding the bristles firmly in place as shown in Fig. 3. Another assortment of articles made from Bakelite is illustrated in Fig. 4, and the makers say that there is no article which can be made from hard-rubber that cannot be made from Bakelite. It has the advantage over this material that it is free from smell and can be made in almost any desired color. It is also more resisting.

Improved Process of Making Square Steel Tubing.

For many purposes, steel tubing with a but joint is suitable and is much less costly than the seamless or even the brazed tube. In the manufacture of metal bedsteads it can be economically employed. A new process of making this kind of tubing, which is principally of square section as shown, has been patented by Robert Koenig of the Phenix Tube Co. of Brooklyn, N. Y., the well known manufacturers of brass and steel tubes.

The essential feature of the invention lies in the fact that the sheet metal strip, from which the tube is made, is strained during the making so that instead of having a tendency to pull apart, it has the property of closing the seam. This feature is accomplished in the following manner:

The strip of metal is shown in Fig. 1A. The next operation forms it in trough section as indicated in Fig. 1B. The third operation produces the round tube, indicated in Fig. 1C. In making the tube, the edges are made with a slight lip as shown so that a tight joint at the seam will be produced. The round



Improved Process of Making Square, Steel Tubing.

tube is next drawn through a roller-die in order to render it square. This die is an essential portion of the process and is made so that the corners of the tube are not worked This strains the metal as previously mentioned so that when the tube is completed, there is no tendency for it to pull apart, but instead, the lips of the seam constantly press against one another.

The extraction of tin from old tin cans has not been found profitable on account of the large amount of foreign matter, in the shape of food, paper labels, and dirt that are always found with them.

Reducing the Cost of Buffing.

If one stops to figure the cost of taking an article up and putting it down again immediately, it will be surprising when considered in large quantities. A Canadian trade paper quotes an instance of this kind in buffing. A buffer seemed unusually busy and it was believed that it was impossible to increase the output. The article he was buffing was taken from one side of the buff wheel, buffed, and then put into a box at the other side. By changing the receiving box so that the buffer could drop the work into it instead of laying it in on the top of the pieces previously buffed, as he had been accustomed to do, the superintendent of the shop found that the actual cost of buffing that particular piece could be reduced ten per-cent. This indicates how a little matter, if considered as a regular thing, is magnified into one of importance.

Chrome Tool Steel Tubing.

The progress that has been made in the manufacture of seamless tubing is indicated by the fact that the Ellwood Ivins Tube Works of Oak Lane Station, Philadelphia, Pa., are now manufacturing seamless, cold-drawn chrome-tool steel tubing. As far as known this is the first instance in the United States in which it has been possible to produce this refractory material in the form of seamless tubing.

The Ellwood Ivins Tube Works were the first concern in the United States to manufacture seamless tubing of any kind of metal, and with one exception, in the world. For a number of years they have made seamless tool steel tubing, but the chrome tool steel tubing is an entirely new departure.

The tool steel and chrome tool steel tubing may be hardened and are now extensively used for roller bearings, drills and other purposes for which solid bars have heretofore been used and bored out. Seamless cold-drawn chrome tool steel tubing has heretofore been considered impossible to produce.

*

The original use of vanadium was in dyeing and the so-called "vanadium-blacks" are obtained by the use of vanadium salts. Until vanadium began to be employed in steel, such a use was the only one known for it.

Limits of Accuracy in Copper and Brass Analysis.

In opening a discussion on the limits of accuracy in analysis, I wish to emphasize the fact that I am referring to technical analysis and not what may be called research work. I only propose dealing with the subject in its relation to the brass and copper industry. All copper ores, and a good many copper products, such as gun-metal ingots, brass ingots, borings and residues are now bought and sold on the assay value. The standard methods of assay in most works and mines are the electrolytic and the iodide assay. Test analyses of both which have been published, show an accuracy to the second place of decimals, but let two different chemists exchange assays of a commercial product or send portions of the same sample twice over under different description to the same chemist, the two results may not agree within 0.2 per-cent.

In technical chemistry there is a limit of accuracy which is allowable. The errors of analysis are: 1. Experimental error. 2. Inherent errors in methods. 3. Errors in sampling. Experimental errors are purely personal ones, but in a works laboratory, errors in the balance due to frequent weighings and unequal temperatures, may cause variations as much as 0.3 milligram in two weighings of a watch glass or a crucible, and to save time in a works laboratory, the weight of a watch glass is often assumed to be the same. Platinum cones may vary 0.2 or 0.3 milligram between two weighings, all of which tends to increase the error. If one takes 0.5 gram of copper, for instance, and electrolyzes it, an error in weighing of only 0.2 milligram is 0.04 per-cent, and copper analyses of this sort are regularly reported to the third place of decimals. Of course, by doubling the quantity taken the error is halved, but then comes the fact that analyses are wanted in a certain time. I mention this as an example of high-grade technical accuracy; the average actual error in works practice is more likely to be double what I have given.

*By Ernest A. Lewis. Abstract from the Journal of the Society of Chemical Industry, Feb. 15th., 1912.

The question of errors of method is too large to be adequately discussed here. I will mention the estimation of iron in tin alloys as an example of how a method may be totally wrong. It was not imagined until comparatively recently that a gun-metal analysis showing 0.2 per-cent iron by the method generally accepted as accurate might easily be 0.2 per-cent out, owing to the iron being precipitated with the tin oxide. This assay is now considerably complicated.

There are some metals which cannot be determined accurately in the commercially pure state directly; examples are tin, lead, zinc and aluminum. They are always bought and sold on the purity after directly estimating the impurity present.

I regularly come across analyses adding up to 99.99 per-cent or 100.01 per-cent, which are substantially accurate only. I recently saw several analyses of gun-metal, made from arsenical copper; scrap and metal nuttings from washing brass ashes; they all added up to 100 per-cent, within 0.02 per-cent either way, but no arsenic oxygen or sulphur was reported. The proportion of these elements present in this material would be at least 0.5 per-cent.

Sampling errors can be avoided by adapting varying conditions of sampling to meet different cases. The sample representing the bulk should be in as fine a state as possible before it is sent to the analyst. The following table shows the limit of accuracy of analyses of material used in the copper and brass trade, which are the extreme errors allowable in technical work:

Metal	*Substance*	*Error**	*Amount for Assay*
Copper	Electro-Copper	0.01%	2.5 grams
Copper	Tough or B. S. Copper	0.05%	1.0 gram
Copper	Pure Brass Alloys	0.05%	0.7 gram
Copper	Fine Mixed Borings	0.50%	10.0 grams
Copper	Coarse Mixed Borings	1.00%	10.0 grams
Copper	Copper Scale	0.25%	10.0 grams
Copper	Rich Residual and Ore	0.50%	10.0 grams
Copper	Poor Residual and Ore	0.10%	10.0 grams
Copper	Brass Ingot Drillings	0.50%	10.0 grams
Tin	Brass (1% Tin)	0.01%	5.0 grams
Tin	Gun-Metal (10% Tin)	0.50%	1.0 gram
Tin	White Metal (50% Tin)	0.50%	5.0 grams
Tin	White Metal (80% Tin)	1.00%	0.5 gram
Lead	Alloys (2% Lead)	0.05%	5.0 grams
Lead	Alloys (30% Lead)	0.50%	1.0 gram
Lead	Alloys (80% Lead)	1.00%	1.0 gram
Zinc	Brass	0.05%	0.7 gram
Zinc	German-Silver	0.20%	0.7 gram
Zinc	Zinc Ashes and Ore	0.50%	10.0 grams
Iron	Brass and Gun Metal	0.02%	5.0 grams
Nickel	German-Silver	0.50%	0.7 gram
Nickel	Pure Nickel	0.20%	0.5 gram
Aluminum	10% Aluminum-Bronze	0.50%	1.0 gram
Aluminum	Aluminum-Zinc Alloy	.....	† grams
Antimony	White Metals	0.50%	0.5 gram
Arsenic	Copper	0.01%	5.0 grams
Phosphorus	Phosphor-Bronze	0.02%	5.0 grams
Phosphorus	Phosphor-Copper	0.50%	1.0 gram

*Either Way

I do not suggest that inaccurate, slovenly work should be encouraged, but it is utterly useless and misleading to report analyses past the second place decimals, when the methods used are not accurate past the first place. If an analysis of a gun-metal, or white-metal can be relied upon to the first place of decimals it is quite sufficient for all practical purposes.

Technical methods of analysis must be reliable within the limits of accuracy required in various trade purposes, and this limit must be known to those who have to make use of the analysis.

Isaac Babbitt Not the Inventor of Babbit-Metal.

It is a wide-spread belief that Isaac Babbitt was the inventor of babbitt-metal and that it was named for him. We hear much about genuine babbitt-metal made after the *original* formula, but, in reality, there was really no original formula.

In 1839, Isaac Babbitt of Boston, Mass., was granted a patent for an "Improvement in the Mode of Making Boxes for Axles and Gudgeons." This is United States patent No. 1252. The claim of the patent was not upon the mixture of the metal but upon a bearing or box of bronze or brass lined with a soft metal, just as a freight-car box is made today. He makes no claim at all upon the soft metal to be used for the lining, but states that "The Inner Parts of These Boxes Are to be Lined with Any of the Harder Kinds of Composition, Known Under the Names of Britannia-Metal or Pewter, of Which Block-Tin Is the Base. An Excellent Compound for This Purpose, I Have Prepared by Taking

50 Parts of Tin
5 Parts of Antimony
1 Part of Copper

but I Do Not Intend to Confine Myself to This Particular Composition."

The remainder of the patent specification is devoted to the manner of making the box and method of lining it with the soft metal.

It will be appreciated, therefore, that babbitt-metal, as it exists to-day, was not invented by Isaac Babbitt. The formula which he mentioned is not used at the present time as it is too soft. It is, in reality, britannia-metal, and does not contain quite enough copper to be of value as an anti-friction metal. While it can be used, and undoubtedly was used at the time the patent was granted, the demands on babbitt-metal have so increased that it has been found expedient to make it much harder. As generally employed at the present time, a genuine babbitt-metal contains:

48 Parts of Tin
4 Parts of Antimony
2 Parts of Copper

It will be understood, accordingly, that while Isaac Babbitt proposed the use of the mixture embodied in his patent, yet it was a regular britannia-metal formula and had been in use for a long period previous to that time.

Testing Enameled Ware.

The use of enameled cooking utensils and other enameled ware is now extensive and there is a wide difference in its quality. The enamel is all sufficiently non-corrosive to answer every requirement, but it is apt to flake off. Splinters enter food, or if ware other than cooking utensils is used, the flaking ruins the appearance of the surface.

An English trade writer in a trade paper claims that the quality may be tested in an easy manner. The article, which, of course must be small and is intended for cooking utensils, is heated over a gas flame until the heat scorches a piece of paper lying in the bottom. It is then plunged into cold water. It is claimed that a good quality of enamel will stand even this test without crazing.

Making Alloys of Titanium with Other Meials.

A method of making alloys of titanium with other metals has been patented by Auguste J. Rossi of the Titanium Alloy Mfg. Co., of Niagara Falls, N. Y. The process has been applied to making alloys of titanium and tin, titanium and nickel, titanium and lead, titanium and zinc, titanium and iron. The method consists in heating the metal to be alloyed with the titanium in an electric furnace with lime as a covering, and then adding a mixture of oxide of titanium and carbon. The titanium is reduced and alloys with the metal.

Questions and Answers.

QUESTION No. 1124. What is the cause of alligator cracks in a bronze casting. This is a round, bronze spindle, 3 inches in diameter, tapering to 1 inch. Two feet long with a core through the center. We are using an oil core made in the proportion of 1 part of linseed oil to 60 of sand.

Answer. We should say that the difficulty is with your core. It is probably so hard that there is no "give" to it and the metal, in shrinking, cracks as the core does not allow it to shrink freely. You will have to use a softer core, either by the use of less oil, more open sand or some other binder in place of the oil.

QUESTION No. 1125. I am having trouble with my borax used as a flux in brazing and cannot remove it from the joint after the brazing has been done. Will you please give me a solution for doing this?

Answer. Hot water is the only liquid that can be used for the removal of the borax in brazing. The hotter you use it the better. Possibly some of the fused borax may be removed by hammering, filing or scraping before immersion in the hot water, thus hastening the operation.

QUESTION No. 1126. What can be used for painting a stereotype mold so as to prevent the metal from adhering to it?

Answer. You will find nothing better than fine, electrotypers' graphite. This can be rubbed on the mold dry by the use of a soft brush and will effectually prevent the metal from adhering to it.

QUESTION No. 1127. How can gold be recovered from a gold plating solution?

Answer. Gold is recovered from a gold plating solution by means of zinc. Use either the zinc dust or zinc shavings. Use from one-half to one ounce to 1 gallon of the plating solution and allow to remain in it for a number of hours with frequent stirring. Then pour off the solution and filter out the zinc left together with the precipitated gold. Wash thoroughly with water and then treat the precipitate with dilute nitric acid (1 part of water and 1 part of acid). This will dissolve everything, when warmed for a short time, but the gold. Now add more water and filter off the gold, wash and dry when it will be ready for use again. In case the gold solution is quite old and has been run with platinum or carbon anodes, it frequently happens that there is very little gold in the solution; so little, in fact, that it does not pay to try to reclaim it.

QUESTION No. 1128. What amount of aluminum can be used in yellow brass sand castings without making them difficult to nickel plate, or which will prevent them from taking nickel at all by electrodeposition?

Answer. Unless you want to use an abnormal amount of aluminum in your brass, say several per-cent, you will have no difficulty in nickel plating the castings. With less than one per-cent, which is never exceeded in making brass castings of ordinary kinds and rarely comes anywhere near this quantity, the castings can be nickel plated as well as any kind of yellow brass. The amount usually used for making the castings run well, is from 0.02 to 0.10 per-cent, and with this quantity of aluminum you will never be able to notice any difference in the nickel plating.

QUESTION No. 1129. What causes work to turn black in a nickel plating solution?

Answer. There are two principal reasons for a nickel deposit becoming dark, other than the regular "burning" on the edges which, of course, every plater is familiar with and knows that his current is too strong. The first is the presence of a small amount of copper in the nickel solution. This may come from work being left in the bottom of the tank where it has fallen. It will be gradually taken up by it. The second is the solution becoming alkaline. This may be caused by potash or soda being accidentally introduced from the cleaning kettle; or by ammonia being added intentionally. If a nickel solution is alkaline, the deposit will be dark in color and brittle. It is very apt to peel in the solution, if the deposit is thick. Alkaline nickel solutions should not be used. They can be brought back by the use of a very small amount of sulphuric acid so that blue litmus paper turns red.

QUESTION No. 1130. What white metal is used for making toilet seat hinges? This metal, we understand, can be used for casting in green sand. We do not think it Monel-metal as it is whiter and casts well, while Monel-metal is difficult to cast in thin sections in an ordinary brass foundry.

Answer. The white metal you have noticed is the following:

Copper	50 lbs.
Zinc	35 lbs.
Nickel	15 lbs.
Aluminum	2 oz.

This mixture is quite white and strong. It casts well in green sand and is cheap.

QUESTION No. 1131. We are having trouble with our copper deposit on wax. We use the galvanoplastic process and an acid copper solution is employed. The solution stands about 20° Beaumé and is made of sulphate of copper with a little sulphuric acid. We use 3 volts. The deposit is brittle and breaks easily in the hand. In plating the copper on the wax, we first strike as follows: The wax is coated with plumbago and then "struck" by a sulphate of copper solution and iron filings. Then we rinse off and put the wax thus coated with a thin copper film in the regular acid copper solution. What is the cause of the brittleness of the copper?

Answer. Your solution has become too acid

and this has been caused by the rapid deposition of the copper. The copper has been deposited faster than it has come from the anodes, thus constantly increasing the amount of sulphuric acid. It is a condition that is very apt to happen in running an acid copper solution. You can reduce the acid in the solution by adding carbonate of copper, and this will neutralize it. The current you are using seems to be too strong also for obtaining a tough copper deposit.

QUESTION No. 1132. We have been supplying composition castings to a customer and he says that they are too hard to machine. The metal seems soft enough to us. We have been making the castings from scrap composition with a little copper. Our customer says he has difficulty in cutting threads. Do you think he is right?

Answer. Your customer is no doubt right. In the language of a machine shop or brass finishing establishment, metal is "hard" when it cuts with difficulty. It is a term in general use and is rather misleading. For example, an ordinary yellow brass (without any lead in it) would be called "hard", but it is soft in the true sense of the word. What you need in your composition is more lead. Add 1 lb. more of lead to each 100 lbs. of composition, and if this is not enough to make it cut freely, add another pound. This will probably be sufficient as you already have some lead in the metal. A free cutting composition should not contain less than 3 per-cent of lead.

QUESTION No. 1133. What is the cyanide process for extracting gold from gold ores? Is this process a gold plating operation?

Answer. The cyanide process for extracting gold from ores is now very extensively used on lean ores and those in which the gold is present in the free state, even though so small that it could not be worked by any other process. The finely ground ore is leached for some time in a rather weak solution of potassium cyanide in water. The gold, as well as any silver that may be present, is dissolved. The clear solution of cyanide, containing the gold, is then drawn off and run into the precipitating tank. This is used to separate the gold. Zinc shavings, freshly cut, are added to the cyanide solution now in the precipitating tank and left for some time. The zinc precipitates the gold in the metallic condition. The clear solution is thrown away and the zinc, containing the gold on the surface, is melted down. The result is a material called "base-bullion" and containing the gold with various other foreign metals. This base bullion is then refined so as to obtain pure gold. This is usually done at the U. S. Mint, to which the mine owners send what base-bullion they obtain.

QUESTION No. 1134. Can you tell me whether I can melt scrap copper in nickel soldering irons? I tried it one day and poured the copper into the molds. When I went to hammer it into shape, the copper crumbled to pieces.

Answer. The trouble you have experienced in casting the scrap copper has been on account of the oxidation. The oxide of copper formed during the melting, is absorbed by the molten copper and renders it brittle when one attempts to forge it out. You will have to use some deoxidizing agent, either silicon-copper or magnesium. The addition of 0.10% of either silicon (1% of 10% silicon copper) or magnesium will give you a sound casting and one that will forge. Soldering-irons, however, are never made by casting in sand, but a rolled rod is forged out. This is not only cheaper than casting, but gives a better iron.

QUESTION No. 1135. We are considering the polishing of some sherardized articles in a tumbling barrel and wish to know what can be used for tumbling in order to brighten them?

Answer. You will find scrap leather good and hard-wood sawdust may also be used. The leather scrap should be cut rather fine if the articles are small. All that is required is a material to do the polishing and cut rags are also used. Leather, however, will give you the best finish.

QUESTION No. 1136. We wish some information in regard to the disposition of old racks and baskets that have been used for nickel plating. The iron racks, that is the ones that are made of iron and have been used for nickel plating, we have melted down and use again for anodes, but the brass baskets and racks cannot be used in this manner. We understand the baskets are worth about 25 cents per pound, but we cannot find anyone who will pay it.

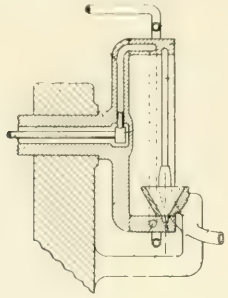
Answer. Old nickel racks and baskets, the base of which is made of brass, will not bring the price you mention. There is no way of removing the nickel except by hammering and this renders it expensive. The only use that can be made of these racks and baskets is for making German-silver or other copper alloy castings containing nickel. They are also frequently sold for the copper that is in them and this is so small that the price obtained is very low.

QUESTION No. 1140. What is the best facing sand mixture for ornamental bronze castings? We want to know how to prepare the molds so as to obtain a bright clean finish which will require the minimum amount of chasing. Do you recommend the gas torch for skin-drying the molds?

Answer. The best facing sand is what is known as "Windsor-Locks" and is found in various parts of the United States. It is a fine, red sand. It cannot be used for making the whole mold on account of its lack of necessary openness, but the mold is faced with it. The remainder of the mold is then backed up with the regular bench sand. The face of the mold is then skin-dried. You can use a gas torch if you are careful, but a stove is better as it gives an even heat and is not so apt to burn the mold. For the finest surface on the casting, the mold is smoked after skin-drying.

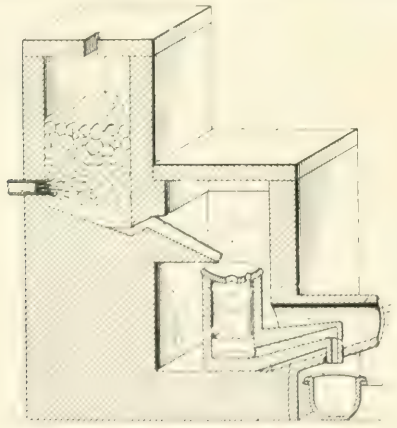
Patent Abstracts.

1,017,943, Feb. 20, 1912. CASTING MACHINE. Robert M. Akin of Ossining, N. Y. A machine for casting a continuous ribbon or wire of metals that are too hard to be squirted through a die like lead or wax. A rotating mold is used and the metal is retained in



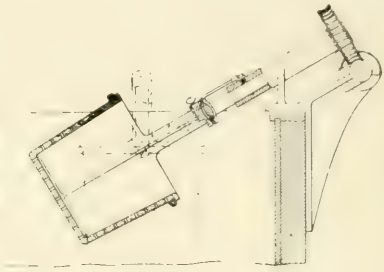
it by centrifugal motion. The molten metal flows into this mold through a spout. It is claimed that steel, iron and brass may be cast in the mold, doing away with the rolling required when large sections are to be made into wire.

1,018,681, Feb. 27, 1912. PROCESS OF FUSING AND PURIFYING COPPER. Walter S. Rockey and Hilliary Eldredge of New York City. Assignors to the Metallurgical Research Co., of the same city. A method of purifying copper. The process is stated to be applicable more particularly to cathode



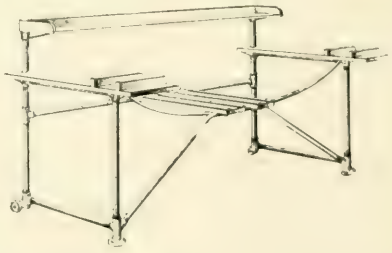
copper. The copper is melted in the furnace heated by oil, and then allowed to flow out into a separate compartment. It is claimed that the volatile gases which the copper contains are forced out by the treatment and peculiar shape of the furnace.

1,020,262, Mar. 12, 1912. ELECTROPLATING APPARATUS. Thomas Richard Canning, Birmingham, England. A plating apparatus for use in plating small quantities, comparatively speaking, or in contrast to the large mechanical plating barrels now used in the United States. The container is the usual stone-ware dipping basket and the work to be plated is placed in it. The mechanism used



for holding the basket and forming the connection is shown in the illustration. The apparatus is intended for plating all classes of small work and in all kinds of solutions. Small quantities may be treated as well as that which fills the basket.

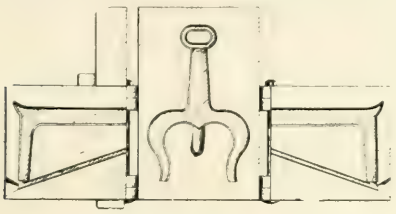
1,020,098, Mar. 12, 1912. MOLDER'S BENCH. Jerry M. Hudson of Piqua, Ohio. A molder's bench made of iron pipe as shown. The advantage claimed for the bench is that it



may be cheaply made and is light and handy for the molder. The illustration explains the manner of making it.

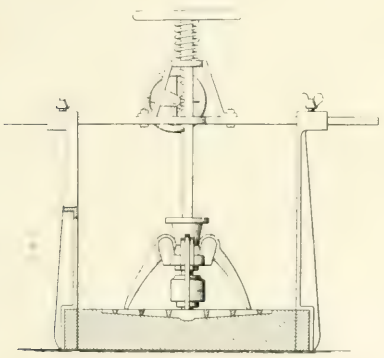
1,017,864, Feb. 20, 1912. AUTOMATIC BUFFING MACHINE. Alexander C. Fyfe of Weehawken, N. J. and Wm. E. Gladstone of West New York, N. J. The machine is made for buffing tubing of all kinds and in an automatic manner. The tubes are fed into a hopper from which they are grasped by a pair of chucks and are automatically fed to a series of buffing wheels.

1,019,248, Mar. 5, 1912. PERMANENT MOLD. Joseph A. Hardin of Anniston, Ala. Assignor to the Interstate Roofing & Foundry Co., of the same place. The mold is made of



cast-iron and is intended for casting andirons and similar ornamental castings. The mold is made in halves and hinged to allow easy removal of the casting and placing together again.

1,018,731. Feb. 27, 1912. PATTERN DRAWING DEVICE. Henry Tscherning of Freeport, Ill. A device for drawing a gate of patterns or a single pattern from a sand mold. It is intended to draw the pattern with ac-

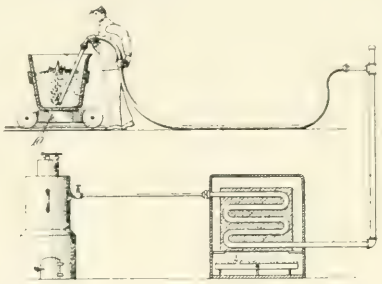


curacy and without danger of injuring the mold. It is particularly applicable to patterns which have long projections and which are apt to injure the mold in hand drawing, thus requiring patching.

1,020,946, Mar. 19, 1912. POLISHING MACHINE. O. L. Dosch of Elizabeth, N. J. Assignor to the Singer Mfg. Co. of the same place. A machine of an automatic nature used for polishing the heads of screws and other similar articles.

1,017,704, Feb. 20, 1912. TESTING APPARATUS FOR HOLLOW CASTINGS. George C. Tallman of Syracuse, N. Y. An apparatus for testing hollow-castings, such as radiator sections, valves or similar goods. The principal feature of it lies in the method of holding the article to be tested, and the rapid means for clamping.

1,019,965, Mar. 12, 1912. TREATMENT OF METALS. Wm. H. Kelley of Los Angeles, Cal. A method of introducing steam into a boiler and then passing through a superheater so that, as the inventor states, it is changed into "nascent hydrogen and oxygen" from



which it passes to the molten metal. It is claimed that the steam thus superheated has strong purifying properties and may be used with advantage in the refining of iron, copper, lead and other metals.

1,019,043, Mar. 5, 1912. MACHINE FOR MAKING METAL TUBES. Henry Higgin of Newport, Kentucky. The machine is intended for forming tubes to be brazed at the joint. The tube is made by feeding strip into

the machine and special mechanism cuts a groove at the joint for the reception of the spelter-solder used for the brazing. The brazing is done in a brazing furnace.

1,019,524, Mar. 5, 1912. PROCESS OF REMELTING AND REFINING OLD OR SCRAP COPPER ALLOY. Walter S. Rockey and Hilliary Eldredge of New York City. The method of melting such scrap, so as to avoid waste and oxidation, by first melting a flux of boracic acid and then submerging the copper under it. In other words, the copper is protected from oxidation while it is actually melting.

1,018,823, Feb. 27, 1912. CORE MAKING MACHINE. Geo. L. Grimes of Detroit, Mich. A core making machine of the jarring type. The essential feature is in the manner of holding the core box and the jarring mechanism. It is intended for large sized cores.

Trade Items.

The Jones Hasp & Lock Co., has been incorporated at Warrenton, N. C., to manufacture hasps and locks. A plant will be built for manufacturing.

The Dairy Machinery & Construction Co. of Derby, Conn., have broken ground for their new brass foundry which they are to build. The factory is located on Housatonic Ave., Derby, Conn.

A new plating department is to be added to the plant of the Chattanooga Iron & Wire Works at Chattanooga, Tenn., manufacturers of wire goods. A new tinning plant is also to be installed. The superintendent of the company is J. E. Morelock.

The contract for the new factory of the Doehler Die Casting Co., of Brooklyn, N. Y., has been awarded. It will be located at Court and Ninth Sts., in that city and is to cost about $50,000. It will be seven stories high and is to be constructed of reinforced concrete.

The Atlas Foundry, Union St., Attleboro, Mass. has been purchased by Peter E. Levey who will use it for the manufacture of fine bronze, silver and gold castings used by jewelers and silversmiths. This foundry was started by the late A. T. Salt, but has been closed for some time. Mr. Levey has a large amount of experience in this class of work, and has been connected with the largest manufacturing silversmiths.

Many manufacturers of metal goods are now using the moving picture machine as a means of advertising their business. Views are taken of the various operations in the manufacture of their goods, and the pictures are then reproduced at Conventions, Exhibits, or elsewhere. Follansbee Bros. Co., of Pittsburgh, Pa., manufacturers of tin-plates, recently employed this method of advertising their business and the moving pictures were shown at a Convention of Hardware Dealers in Cleveland.

The Rojas Electro Chemical Co., 516 West 25th. St., New York City, manufacturers of solutions for producing "Electrochroma", have recently perfected a new class of solutions for imparting a gold deposit or color to all kinds of base metals. This is done without the use of any gold and all kinds of rose gold, green gold, and old gold effects can be obtained very cheap. This should prove extremely valuable to manufacturers of cheap jewelry, novelties and other classes of work which will not admit of the use of gold. This company sells the solutions ready for use and the gold shades are produced by electrodeposition. The Rojas Electrochemical Co. have also improved their solutions for producing the various colors on metals, so that they can be used with the voltaic dynamos. This now allows them to use the best of all colors.

The Laconia Car Co. of Laconia, N. H., are to commence the manufacture of automobiles. The capital stock of the company was recently increased to $2,000,000.

The Winkley Co. of Detroit, Mich., manufacturers of brass goods, oil cups, etc., and also brass founders, have awarded contracts for the enlargement of their plant in that city.

The Great Western Smelting & Refining Co., Seattle, Wash., is to build a new scrap metal smelting and refining plant at 9th and Holgate Sts. It will be of steel and to cost $250,000. This company is a branch of the main concern in Chicago, Ill.

A new plant for the manufacture of wire cloth is to be built in Ottawa, Canada, it is reported, by John R. Buchanan of the Appleton Wire Works of Appleton, Wis., manufacturers of the same line of goods. Mr. Buchanan has severed his connection with this company and is organizing a company for manufacturing in Canada.

The new Canadian factory of the Mueller Mfg. Co., of Decatur, Ill., manufacturers of plumbers' brass goods, is to be located in Sarnia, Ont. It is expected that the new plant will soon be started. This company is one of the largest and oldest manufacturers of plumbers' brass goods in the United States. They make a specialty of high grade goods. The Canadian company will be incorporated as a separate organization.

At the annual meeting of the Gorham Mfg. Co., of Providence, R. I. recently held in that city, the following officers were elected: President, Edward Holbrook; vice-president, John S. Holbrook; secretary and assistant treasurer, John F. P. Lawton, assistant secretary, Wm. E. Keyes; superintendent, Fred C. Lawton. The following directors were elected: Edward Holbrook, Herbert J. Wells, John S. Holbrook, John F. P. Lawton, E. Frank Aldrich, Russell Grinnell, Fred C. Lawton, Henry S. Sprague and Frank W. Matteson.

W. W. Wells, 368 Victoria St., Toronto, Canada, states that he is the only manufacturer of high-grade nickel anodes, made from Canadian grain nickel, in the Dominion of Canada. He has recently enlarged his plant for casting anodes and now has an excellent equipment for the purpose. In addition to the manufacture of nickel anodes, brass, copper, bronze and zinc anodes are made, and an exceptionally complete line of plating and polishing supplies are manufactured. Mr. Wells announces that he manufactures in his own factory, many of the goods usually purchased by the small dealer. The large number of American manufacturers who are now establishing plants in Canada, should give Mr. Wells an opportunity to quote on supplies as, owing to the import duty, he is able to make attractive prices.

The new, three-story addition to the plant of the South Bend Watch Co. of South Bend, Ind., has now been completed.

A new, two-story and basement factory is to be built by the C. M. Hall Lamp Co., of Detroit ,Mich., manufacturers of automobile lamps. This factory is to be 60x90 feet.

The Pope Mfg. Co. of Hartford, Conn., manufacturers of automobiles, motor-cycles and bicycles, have issued $1,000,000 worth of bonds. These bear 6% interest and have two years to run. They have been purchased by a Boston syndicate.

The suit of the United States Government against the Aluminum Company of America, is, it is stated, being amicably arranged by the counsel for both sides. It is reported that a suit will be brought against the company in Pittsburgh, and that the parties will then make their appearance in court and the agreed decree will then be entered.

The Sterling Mfg. Co., of Los Angeles, Cal., has purchased the plant of the A. S. O'Neil Co., 1640 San Fernando St., Los Angeles, and will shortly begin an enlargement of the plant. A brass foundry is part of the plant that has been absorbed, and new equipment for the manufacture of oil-cans is to be added. Sheet brass goods are also to be manufactured. The Sterling Mfg. Co., are located at 240 Byrne Building.

The United Foundry & Machine Co. has been organized by Wm. C. Buckelew of Bridgeport, Conn., and others. This company will manufacture aluminum and brass castings and do a jobbing foundry business. A piece of land on Bruce Ave., in Bridgeport has been obtained and a foundry is to be erected shortly. Mr. Buckelew was formerly with the Fairfield Aluminum Foundry Co., which sold out its plant and business in Fairfield, Conn., to the Aluminum Castings Co. of Detroit and who are now operating it. The United Foundry & Machine Co. will make a specialty of aluminum work for automobiles.

The Meaker Company, Fulton and Elizabeth Sts., Chicago, Ill., manufacturers of electrogalvanizing apparatus and solutions, will shortly move to their new plant which is practically across the street from their present one. They have one of the most modern plants for electrogalvanizing and the manufacture of electrogalvanizing machines and equipment. The new plant contains all the best features which the extensive experience of the company has demonstrated to be the best. The building is one story high, with the exception of a portion on Fulton St., and this is two stories high, the top floor of which will be used for offices. The company make a specialty of galvanizing and supplying their self-sustaining solution to the trade. They have already equipped over sixty plants with their process and apparaus. In addition to galvanizing apparatus and solutions, they manufacture their "Platers' Magnet" which is used for removing iron or steel goods from plating tanks.

Lamplough & Co. of London, England, manufacturers of automobile radiators, are, it is reported, to build an American factory in Detroit, Mich., for the manufacture of their goods.

The equipment of the Universal Stenotype Co., of Owensboro, Ky., manufacturers of stenotypes, is to be increased so that the output can be doubled. Electroplating is now carried on at their works.

The Anderson Tool Co. have moved their factory from Anderson, Ind. to Hamilton, Ohio where a new factory has been built and is now in operation. The manufacture of the Anderson Automatic Scales and the Anderson Computing Oil Tank is carried on.

The new factory to be erected by the A. Y. McDonald Mfg. Co., of Dubuque, Iowa, manufacturers of plumbers' brass goods, pumps, etc., will be 100x260 feet and four stories high. A large amount of new equipment will be needed.

The Jackson Ornamental Iron & Bronze Works, Jackson, Tenn., are commencing the manufacture of brass and bronze grill work for banks and office buildings. This company is a comparatively new one and was recently organized. The officers of the company are: President, J. C. Felsenthal; vice-president, W. R. Sparkman; and J. L. Losier, secretary and general-manager.

Bureau Bros., brass founders, 21st St., and Allegheny Ave., Philadelphia, Pa., have sold their plant at this address and have purchased a new site. This new location is at 23rd. and Westmoreland Sts. and a new plant is to be located on it. The plant will be much larger than their present one. The plot of ground purchased is 187 x 395 feet and a brass foundry, finishing shop and office are to be erected.

The fire which partially destroyed the distilling department of the Anderson Chemical Co., at Wallington, N. J., on March 6th, did not interfere with their business or manufacturing to any extent. The soluble cotton department was not affected and they announce that the quality of their goods can never be influenced by any other external influences. Quality is one of the things that they will maintain at any cost.

The General Supply Co., 1122 St. Clair Ave., N. E., Cleveland, Ohio desire the trade to know that they are the largest exclusive plating supply house in Ohio. Their familiarity with the trade enables them to select materials and supplies that are best adapted for the purpose. They carry in stock all kinds of plating supplies and are prepared to ship at once upon receipt of order. All kinds of polishing wheels and buffs are carried in stock for every kind of use. This company is making a particular specialty of polishing and buffing compositions and solicit a trial of these goods as they feel that such a trial will fully convince a consumer of the great superiority of their goods. They are also carrying mill and brass founders' supplies.

Ventulett Bros., have bought out the plant and business of the Burns Plating & Polishing Co., Golden Hill St., Bridgeport, Conn.

The Harris Wire Co. has succeeded J. Walter Perry of Southport, Conn., manufacturer of fine wire. It is expected in the near future that heavier sizes of wire will be drawn.

The United States Chemical Co., 3621-3623 Lakeside Ave., N. E., Cleveland, Ohio, manufacture and sell a complete line of electroplating and polishing supplies. Complete plants for electroplating or polishing are installed by them, and they ask the opportunity of quoting.

The Loew Mfg. Co., 9100 Madison Ave., Cleveland, Ohio, manufacturers of hardware specialties, and who conduct a brass foundry in connection with their works, have increased their capital stock to $400,000. This increase will be used to add new equipment to their plant.

The Monarch Engineering & Mfg. Co., 1208 American Building, Baltimore, Md., manufacturers of the "Steele-Harvey" tilting crucible furnaces, are now making a specialty of furnaces for the melting of nickel and nickel alloys. The furnace uses oil for fuel and by means of special construction a high heat is generated. Crucibles are used for the melting.

P. Pryibil, 512-514 West 41st. St., New York City, the well known manufacturer of spinning lathes and which are the result of the most modern facilities for manufacturing and fifty years of experience, is now manufacturing the "Pryibil" buffing lathes which are of the same high standard as his spinning lathes. When in the market for buffing or polishing machinery, particulars of these lathes should be requested.

The "Buffalo Air-Brush," made by the F. J. Lederer Co., 71 Forest Ave., Buffalo, N. Y., is a highly favored brush for the application of lacquers, paints, enamels and varnishes. One of the features of the brush is its great durability. It is free from complications and is built for hard, factory usage. It is so simple that a boy can use it. The F. J. Lederer Co. are the patentees and manufacturers of the brush and ask the opportunity to send a description and price. The brush is now in use in many of the leading establishments.

The attention of brass founders, smelters and copper manufacturers is called to "Uraniumite" made by the Uraniumite Company of America. The office of this company is at 609 Main St., Buffalo, N. Y. They state that it is the best assimilator and scavenger for aluminum, brass and bronze castings and produces sounder and tougher metal. By means of it, aluminum may be alloyed with any metal. When used as a flux, it lessens the cost of production. This material is one of the most recent and novel fluxes that has yet appeared in the brass foundry line, and the producers will be glad to give full information and prices. They desire the opportunity to send their "Booklet A" which tells the story.

The American Brass & Metal Works, 82 Washington Ave., Detroit, Mich., are preparing plans for a one story factory. This will be 40x150 feet.

The Randall-Faichney Co., 251 Causeway St., Boston, Mass., manufacturers of surgical instruments and automobile accessories, have purchased a new site upon which a new factory will be erected. This will be used for the manufacture of brass goods and light metal work.

The Waterville Corporation, Waterbury, Conn., which is owned by the Chase interests of Waterbury, will erect a factory at Waterville, Conn., on property owned by the corporation. The building to be erected will be 120x300 feet and one story high. It will be used in connection with the Chase Rolling Mill, manufacturers of brass sheet, rod and wire.

The Webster & Perks Tool Co., Springfield, Ohio, have issued a catalogue of their grinding and polishing machinery. A very complete line of buffing and polishing lathes are described and illustrated. They also manufacture belt strapping attachments. A specialty of the company is wheel guards or protection hoods for use with emery wheels.

The General Bakelite Co., 100 William St., New York City, manufacturers of Bakelite in all its forms, are sending out to the trade their No. 2 book of information in which a large amount of information is contained and from which abstract is printed elsewhere in this issue. The various uses for lacquers, electrical work and art metal goods are described and the book will prove of the utmost interest to those who use any of these classes of goods.

A Mendleson's Sons, 20 Broadway, Albany, N. Y., desire the trade to write them at once for special low prices on caustic-soda, caustic potash or chloride of lime. They sell lye and potash in crushed or powdered form. It is packed in any size container and will be put up under a special label if desired. They are also manufacturing a special compound for washing and dipping purposes, and for use on brass, bronze, copper and nickel. This company has been in business for many years and are one of the largest producers of potash and lye.

TheAnderson Chemical Co. announce to the trade that they are now producing a new solvent for soluble cotton, for the manufacture of lacquers. This substitute is known as "Alco Deo" and owing to the high price of amyl-acetate, this substitute will meet with the approval of the trade. This new material produces a water-white lacquer which gives a hard, tenacious film. It contains no acid and will not develop any. The Anderson Chemical Co. announce that the best results, however, are obtained by the use of their special "Alco Deo" soluble cotton in connection with the "Alco Deo" solvent. Brass manufacturers and other metal goods manufacturers are now taking much interest in this new solvent.

The Bennington Scale Co. has been incorporated in Montpelier, Vt. with a capital stock of $100,000 to manufacture scales.

The brass foundry of the Sterling Machine & Stamping Co. of Wellington, Ohio was recently destroyed by fire. The foundry will be rebuilt. This company manufactures automobile accessories and also vacuum sweepers.

The Reeves Vacuum Cleaner Co. has been incorporated in Milford, Conn., with a capital stock of $5,000 to manufacture vacuum cleaners. The incorporators are William Reeves, Edwin Reeves and Roscoe Reeves.

The Doehler Die Casting Co., Court and 9th. Sts., Brooklyn, N. Y. have established an office in Detroit, Mich. in the Ford Building. It will be under the direction of the vice-president of the company, H. B. Griffin.

The Bridgeton Chandelier Co. has been incorporated in Bridgeton, N. J. for the manufacture of chandeliers and gas fixtures. The capital stock is $100,000 and the incorporators are J. L. Rice, W. C. Rice and J. D. Reeves.

The Williamsville Buff Mfg. Co., Danielson, Conn., buff manufacturers, are issuing some advertising matter relative to their goods, one of which is a monthly calendar for desk use. They also announce that they are agents for the Northampton Emery Wheel Co., The Stow Mfg. Co., manufacturers of flexible shafts, and the Washington Mills Emery Mfg. Co.

The Lake Erie Smelting & Refining Co., Sweeney Ave., Cleveland, Ohio, are purchasers of all kinds of copper bearing material and solicit the opportunity to quote. They state that they will pay full price on the customers or their own analyses. They especially desire washings, foundry ashes, grindings, sweeps, skimmings, drosses, and brass and composition chips and turnings.

A new company has been organized in New Britain, Conn., by Geo. E. Prentice, formerly superintendent of the Traut & Hine Mfg. Co., of that city. A factory has been obtained in Kensington, a suburb of New Britain, and formerly occupied by the Swift-Waters Co. The capital stock is $100,000 and the manufacture of buckles and sheet metal novelties will be carried on. It is expected that operations will be commenced within a month.

The W. S. Rockwell Co., 50 Church St., New York City, furnace engineers and manufacturers, have issued a new and very extensive catalogue No. 14, describing and illustrating the large line of furnaces which they manufacture. This catalogue is 9 x 12 inches in size and contains 46 pages. Photographic reproductions of annealing, melting, heating, brazing, forging, tinning and many other kinds of furnaces are given. This catalogue will prove of great interest to those who have occasion to heat or melt metals of any kind. The furnaces illustrated are the oil-burning types and it is stated that the catalogue is specimen sheets from a larger catalogue to be issued later.

At the annual meeting of the Newburyport Silver Co. of Keene, N. H., manufacturers of sterling silver wares, it was voted to increase the capital stock to $350,000.

The French Mfg. Co. of Waterbury, Conn., manufacturers of small brass and copper tubing, are to tear down one of their present buildings and erect a new one on the site. It will be 40x100 feet, two stories high.

The Alma Mfg. Co., 111 Light St., Baltimore, Md., manufacturers of buckles, are to erect two additions to their plant on South Fulton Ave. Electroplating and metal finishing are carried on.

The A. H. Coplan Co., Ltd. of Ottawa, Canada, brass and steel founders, are investigating sites in Western Canada with a view of starting a branch plant. Winnipeg, Manitoba is being considered.

The Metal Office Furniture Co., has been incorporated in Grand Rapids, Mich., with a capital stock of $75,000 to make metal furniture. The company has purchased property at South Division St., and Pere Marquette crossing, and is to build a factory on it. Steel filing cabinets and other office devices are to be manufactured.

The Westinghouse Electric & Mfg. Co., of Pittsburgh, Pa., have recently placed on the market an electrically heated solder pot that is quite novel and satisfactory to use. By its use, the heat of the solder may be controlled within very narrow limits and the heating prolonged as desired. The pot may be placed near the workman, which is a useful feature.

The Bosch Magneto Co., which recently erected a plant in Springfield, Mass, for the manufacture of automobile magnetos, are considering the transferring of their factory to Bloomfield, N. J. The reason for this removal, it is stated is the objectionable location of their Springfield plant. The plant of the Simms Magneto Co., at Bloomfield, N. J., is being considered.

The Lavigne Mfg. Co., of Detroit, Mich., manufacturers of brass goods, brass novelties and aluminum goods, have disposed of their steering gear business and will hereafter devote their whole plant to the manufacture of brass and aluminum goods. The steering gear business will be handled by a new company called the Lavigne Gear Co. J. P. Lavigne was recently elected president of the Lavigne Mfg. Co.

A new rust-proof sheet steel called "Lohmannized" is being manufactured by the Brier Hill Steel Co., of Youngstown, Ohio. This steel, the manufacturers state, is treated with lead which permeates the metal, but does not act in the manner of an ordinary coating. Ordinary lead coated steel will separate from the coating when bent, but with the "Lohmannized" steel, this will not occur the makers say. The tenacious manner in which the coating holds is due to the fact that the lead permeates the surface and is not a mere superficial coating.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98.99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal	.50
Alcohol, Denatured	gal	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.19
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia, 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¾
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Sulphocyanate	lb.	.50
Amyl Acetate	gal.	3.00
Antimony	lb.	.08
Arsenic, Metallic	lb.	.10
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal	.50
Bismuth, Metallic	lb	2.00
Bitumen, see Asphaltum.		
Blue Vitriol, see Copper Sulphate		
Borax, Crystals or Powdered	lb.	.10
Borax, Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Carbon Tetrachloride	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.50
Casein, Casein	lb.	.16
Copper, Lake, (carload)	lb.	.16¼
Copper, Lake, (case)	lb.	.17⅞
Copper, Electrolytic, (carload)	lb.	.16¾
Copper, Electrolytic, (case)	lb.	.17¾
Copper, Casting, (carload)	lb.	.16
Copper, Casting, (case)	lb.	.17
Copper, Nickel, (Nickeline)	lb.	.35
Copper, Carbonate, or Malachite	lb.	.60
Copper, Sulphate (Blue Stone)	lb.	.07
Copper, Sulphate, see Metals, Bichromate of		
Copper, Tartar, see Potassium Bitartarate		
Crocus, see Polishing Powder		
Dextrin	lb.	.15
Ebony, Black	lb.	.04
Ebony, Red	lb.	.05
Flint, powdered	lb.	.05
Flour, Spar	lb.	.04½
Fused Oil	gal	.50
Gold, Chloride	troy	.60
Gum, Copal	lb.	.30
Gum, Gamboge	lb.	.70
Gum, Mastic	lb.	.70
Gum, Sandarac	lb.	.50
Gum, Shellac, brown	lb.	.60
Gum, Shellac, white	lb.	.70
Iron, Perchloride	lb.	.05
Iron, Sulphate (Copperas)	lb.	.01
Lead, Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	1.16
Mercury, Metallic (Quicksilver)	lb.	.43½
Mercury Nitrate	lb.	1.50
Mercury Oxide, Yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salt)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb	.40
Nickel Sulphate (Single Salt)	lb.	.12
Nitre (Saltpetre), see Potassium Nitrate		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, Yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Chloride	oz.	20.00
Platinum Metallic	oz	16.00
Potash-by Alcohol, in sticks	lb	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb	.60
Potassium, Yellow Prussiate	lb	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb	.50
Pumice, Crushed	lb	.05
Quartz, Powdered	lb	.01
Rosin, Yellow	lb	.08
Sal Ammoniac, see Ammonium Chloride		
Sal Soda, see Sodium Carbonate		
Silver Chloride, dry	oz	.75
Silver Cyanide	oz	1.00
Silver, Fine	oz.	.58¾
Silver Nitrate, crystals	oz	.50
Soda Ash	lb	.02
Sodium Biborate, see Borax		
Sodium Bisulphite	lb	.15
Sodium Carbonate (Sal Soda), crystal	lb	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (Caustics)	lb	.15
Sodium, Hyposulphite (Hypo)	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb	.05
Sodium Phosphate	lb	.09
Sodium Silicate (Water Glass)	lb	.04
Soot, Calcined	lb	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate		
Sulphur (Brimstone), in lumps	lb	.03
Tin Chloride	lb.	.45
Tin, Metallic	lb.	.45
Turpentine, Venice	lb.	.50
Verdigris, see Copper Acetate		
Water, Distilled	gal	.15
Water Glass, see Sodium Silicate		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Gronid Chalk)	lb.	.02
Zinc, Carbonate, dry	lb.	.19
Zinc, Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, Sulphide	lb.	.06¾

THE BRASS WORLD AND PLATERS' GUIDE

VOL. VIII. BRIDGEPORT, CONN., MAY, 1912. No. 5.

A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.

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Contents for May.

Acetone and Its Properties 165
Alloy, Supermagnetic 166
Aluminum, Compound Sheet 176
Aluminum, Process for Coloring 164
Babbitt-Metals, Specifications for 175
Basse & Selve, The Brass Plant of 155
Boron for Purifying Copper 166
Brass and Bronze Plating Solutions and How to Make Them 170
Brass Foundry Mixtures, Standard 167
Buffing of Metal Goods, Automatic 179
Celluloid with Metal, Inlaying 173
Composite Sheet Metals, New 176
Copper, Effect of Current on Electrodeposited 178
Electric Furnace, Tilting 181
Etching Solution, New 180
Extrusion Metal, Extending Consumption of 153
Galvanoplastic Articles, Making 175
Gold by Titanium, Hardening 176
Graphite Babbitt-Metal, Making a 173
Nickel in Double and Single Salts 179
Patent Abstracts 184
Pyrophoric Alloy, New 180
Questions and Answers 182
Rolled Shapes in Brass and Bronze, New 177
Silver by Titanium, Hardening 176
Silver-Ware, Buffing 154
Solder, Specifications for 174
Titanium for Hardening Gold and Silver 176
Trade Items 186
Tungsten Carbide for Meter Jewels 179
Wire While Hot, Drawing 181
Zinc Oxide, Volatility of 180

The Extending Consumption of Extrusion Metal.

Extrusion metal is one of the comparatively recent products of the brass rolling mill and first made its appearance in England where the extrusion machine was evolved in its present condition. The "progenitor" of the extrusion machine was the lead-pipe machine and, theoretically, there is no difference between them. Lead-pipe is made cold, while extrusion metal is produced hot. The process of making is the same.

Extrusion metal as made to-day is composed of copper and spelter with occasionally lead added for special purposes. The proportions are nearly always as follows:

Copper	55 %
Zinc	45 %

This mixture has been found to suit the requirements better than any other for the following reasons:

1. It is quite soft when red hot.
2. It is strong but not brittle and has sufficient elongation to stand bending etc.
3. The cost is low.

It is a well known fact that the brasses containing as large a quantity of spelter as this mixture are much softer when red hot than the so-called Muntz-metals, containing around 60% copper. This property enables the shapes to be squirted out of the die with great facility and at a low heat.

The strength of extrusion metal, on account of the large amount of spelter used in the mixture, is such that the rods and shapes can

be used for a large variety of structural purposes, heretofore impossible with ordinary brass on account of its softness. For this reason, the extrusion metal shapes may be used for many purposes where brass castings were heretofore employed; and, at the same time with less cost. The color of the mixture, a golden yellow, is also attractive when used for ornamental work.

Extrusion metal shapes are made in the following manner: A red hot billet of the brass containing the right proportion of copper and zinc, is placed in a chamber in what is known as the "extrusion machine head." A plunger or ram, operated by hydraulic means, is brought against the red hot metal, forcing it through a die. The shape of the die determines the shape of the rod which issues from the machine. Many different shapes are now used, adapting the rods to special uses.

A strong, stiff metal rod is produced which has been found admirably adapted to many purposes. The mixture is a cheap one, and the brass manufacturer is enabled to use his scrap in the form of washings and similar material in the manufacture of extrusion metal. The admixture of iron, lead and other impurities, which prevent the brass from being used in ordinary sheet, rods or wire, do not injure the extrusion metal. In fact, the present of considerable iron, which is a great detriment in ordinary brass on account of its becoming hardened by it, improves extrusion metal as it hardens and strengthens it and this is what is wanted. At the same time it does not harden the metal while hot, so that the working at a red heat is not impaired.

At the present time, there are several brass manufacturing concerns operating extrusion machines, and another large manufacturer is about to equip its plant with one.

In casting brass in sand, if the gate breaks off in the mold, it usually indicates that the metal is not good. Such a breakage shows that the metal is red short and breaks while cooling. The difficulty may be caused by the presence of sulphur, antimony, arsenic or other foreign elements in the metal. Bronze or composition acts in the same manner as brass.

Buffing Silver Plated Ware.

Very little silver plated ware is now burnished and this is almost exclusively confined to flat-ware. Now and then other articles are burnished, but they are some shapes which can be more rapidly and conveniently burnished on a lathe than buffed on a buff wheel. Flat-ware is burnished because the maximum amount of wear is demanded of the goods. Burnishing hardens the silver deposit and, therefore, it resists the abrasion, to which it is subject, better than if buffed. Then, too, no silver is removed in burnishing so that the full amount of metal put on the goods and guaranteed by the manufacturer will be on them when they reach the customer. Buffed goods may be light, provided the buffer is careless in his work. Burnishing, therefore, is particularly suited for flat-ware. It is almost exclusively done in the United States by machines and cheap operatives.

In the case of hollow-ware or other silver plated ware, buffing is carried out. It greatly lessens the cost. The burnishing of hollow-ware means hand work, and this is quite expensive. Hollow-ware is not subject to the wear and tear which accompanies flat-ware. Therefore, buffing is quite suitable for finishing the goods.

In buffing silver plated goods, the deposit is preferably scratch-brushed before buffing as it serves to harden the silver deposit in a manner analagous to burnishing. Many manufacturers are now abandoning the scratch-brushing operation, particularly when a bright deposit is used, as it saves one operation, but it is considered the best procedure to first scratch-brush the plated surface in order to harden it. It should always be followed with a soft and dead silver deposit, but with a bright deposit which is harder, it is not so essential and discretion can be employed.

The buffing of the silver is done on a rag buff with soft rouge. Some manufacturers prefer a black buffing composition on account of the color it produces and it is quite extensively used on some classes of work. White buffing compounds are also used. A soft, red rouge, however, seems to give about as good a "color" as anything that could be desired, and it is more extensively employed than any other composition.

The Manufacture of Brass and Copper at the Plants of Basse & Selve, Altena, I. W., Germany.

Among the largest brass and copper rolling mills in Germany, as well as in the world, are those of Basse & Selve, Altena, I. W. Fifty years have already passed since the founding of this firm and in that time it has grown to a size that places it in the foremost rank of not only brass and copper manufacturers, but of any kind of manufacturing. Some 3,500 hands are now employed in its works. The reputation which the firm has obtained in this period of time has been of the highest character, and their goods are known all over the world.

To celebrate the fiftieth anniversary of the founding of the firm, a very extensive monograph has been issued from which we are enabled, with the kind permission of Basse & Selve, to reproduce some of the illustrations and to publish extracts. The monograph is issued in the form of an elegantly compiled and illustrated book of one hundred and fifty pages, in which the complete history of the firm is given and a description of their works and products published. No doubt such data will be of interest to those who follow the manufacture of brass and copper goods in the United States. In this connection, it may be said that the firm of Basse & Selve stands unique in the line of manufacture of non-ferrous metal products, for the reason that

Fig. 1. Hot Copper Mill at the Linscheid Works of Basse & Selve, Showing the Hot Rolling of Sheet Copper.

not only does it make brass and copper sheet, rods, wire and tubing, but manufactures a very extensive line of brass and aluminum castings. In the line of manufactured goods, of an unusual nature, air-ship propellers and automobile engines are produced; and the firm likewise are one of the largest smelters of nickel in the world. They also manufacture cartridges. There are no concerns in the United States which manufacture such a variety of products, and in this country the lines are separate and distinct.

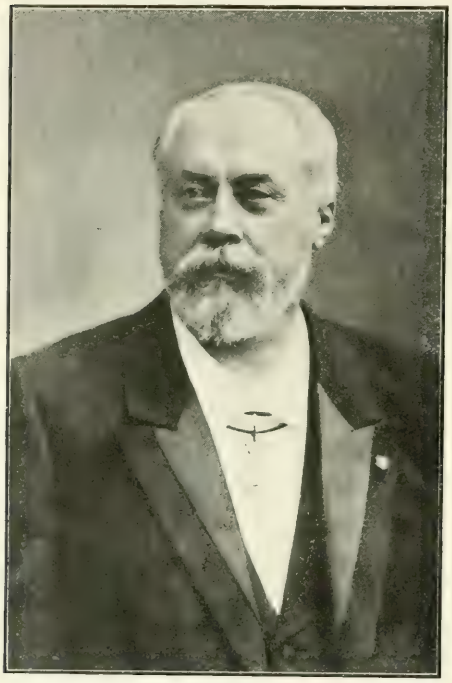


Fig. 2. The Late Gustave Selve Who Built Up the Business as it Now Exists.

On January 26th, 1859, the actual founding of the firm of Basse & Selve took place by the acquisition of property at Peddensiepen near Lüdenscheid, but it was not until the year 1861 that the brass rolling mill was started. At this time the manufacture of brass sheet and brass wire was commenced. The number of employees at this time was 10. In 1862 the real beginning of the firm under the present name was made as it was during this year that their name appeared in the commercial register at Ludenscheid. The partnership constituting the firm was then made between Carl Basse and H. D. Selve. The eldest

Fig. 3. Marie Selve, Widow of Gustave Selve, and Who is Now Owner of the Firm of Basse & Selve.

Fig. 4. Walther Selve, Son of Gustave and Marie Selve, and Who is Now at the Head of the Business.

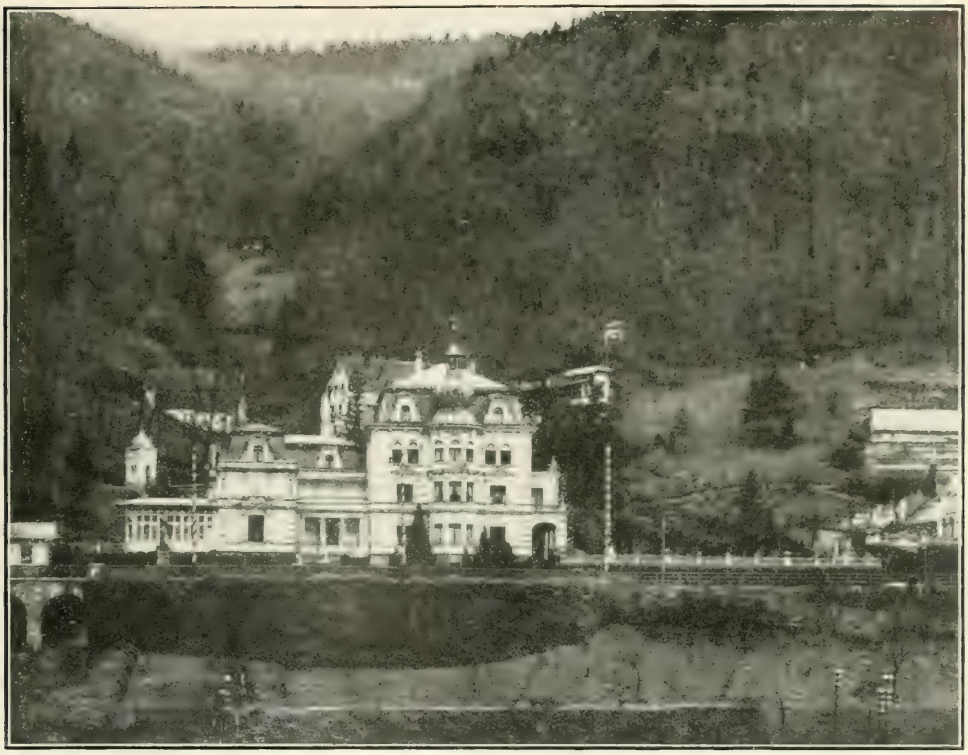


Fig. 5. The Villa Alpenburg, Altena, I. W., Germany, the Home of the Selve Family.

Fig. 6. Wilhelm Ashoff, General-Manager of the Firm of Basse & Selve.

son of the latter, Gustave Selve, whose portrait is shown in Fig. 2. was placed in charge of the works.

In 1864 the number of employees was 40 and the manufacture of German-silver sheet and wire was commenced. The manufacture of copper wire was also begun at this time. In 1868 the manufacture of cartridges and cartridge shells was commenced. The number of hands at this time had increased to 61. During this year the Schwarzenstein works in Altena was acquired. These works were formerly in the possession of Count Otto von Stolberg-Wernigerode and had been conducted for the manufacture of iron.

In the year 1870, a contract was made with the Italian Government to supply them with cartridges and cartridge shells which finally culminated in the establishment of the Donaz works in Upper Italy for the manufacture of these materials in that country.

Gustave Selve became a partner in the firm of Basse & Selve in the year 1872 and at that period the number of employees had increased to 165. The next year witnessed the death of

Carl Basse and the withdrawal from the firm of H. D. Selve. In the year 1874 the smelting of nickel was commenced in Schwarzenstein and the manufacture of nickel wares and coin blanks was henceforth carried on.

The present firm of Basse & Selve is, in reality, an amalgamation of a number of German industries manufacturing brass, copper and aluminum goods and the late Gustave Selve was instrumental in bringing out the union. In the year 1883, after the death of his father, he became the sole owner of the business and which, upon his death on Nov. 7th. 1909, reverted to his widow Frau Marie Selve, whose portrait is herewith shown in Fig. 3. At the time of his decease, the number of employees of the firm were 2904.

Walther Selve, son of Gustave Selve, upon the death of his father became a member of the firm. This took place in 1911 at the fiftieth anniversary of the founding of the company, and it is noteworthy that the number of employees of the company had increased from 10, in 1861, to 3,500 in 1911, half a century afterwards.

The family of Selve, on account of the building up of the large industry which bears their name, have become one of the leading German families and the late Gustave Selve bore the title of Geheimrat, one which is given for meritorious acts and deeds. That the family has accumulated wealth is evident and they have been noted for the care and anxiety that they have displayed towards their employees. It seems to be characteristic of German enterprises to take more interest in the welfare of their employees than is manifested in the United States. A perusal of the monograph will indicate that not only is the physical and moral wellfare of the employees of the firm of Basse & Selve carefully looked after, but the education of the children has been made a particular study and schools under special instructors have been established in the localities in which the factories are situated.

That the Selve family have artistic taste is evidenced by the home in Altena. It is called the "Villa Alpenburg" and the picturesque surroundings shows how manifest the German feeling is for nature. This villa was the home of Gustave Selve until his death and in addition to this country home, one in Bonn is also maintained.

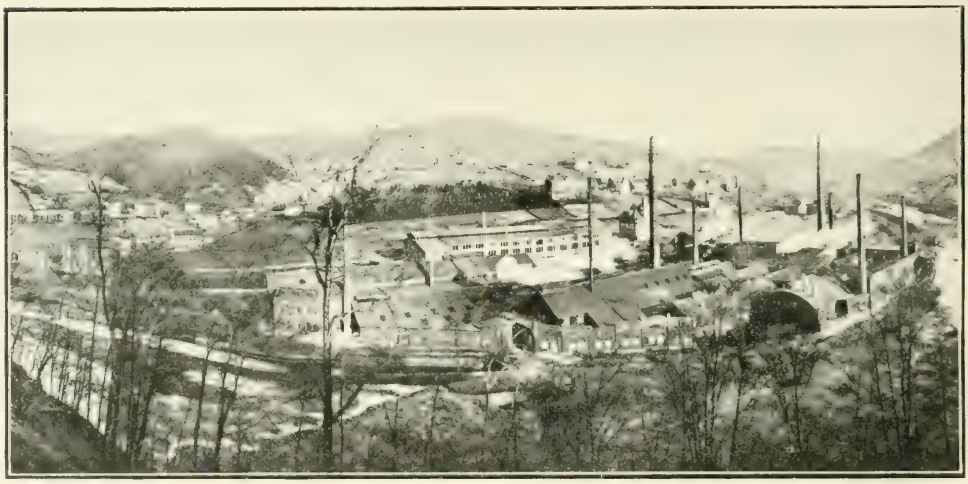


Fig. 7. The Linscheid Works of Basse & Selve, Interior Views of Which are Shown in Figs. 1 and 8.

The mills of the firm of Basse & Selve are distributed in a number of different places. One of the mills is known as the "Linscheid Works", the outside view of which is shown in Fig. 7. It is a noteworthy fact that, like the brass mills in the Naugatuck Valley, Connecticut, U. S. A., a river is always close at hand. The large brass mills in the Naugatuck Valley were all started because water power was obtained and, therefore, a river was a necessary adjunct. It is often a matter of wonder why, when larger rivers were close

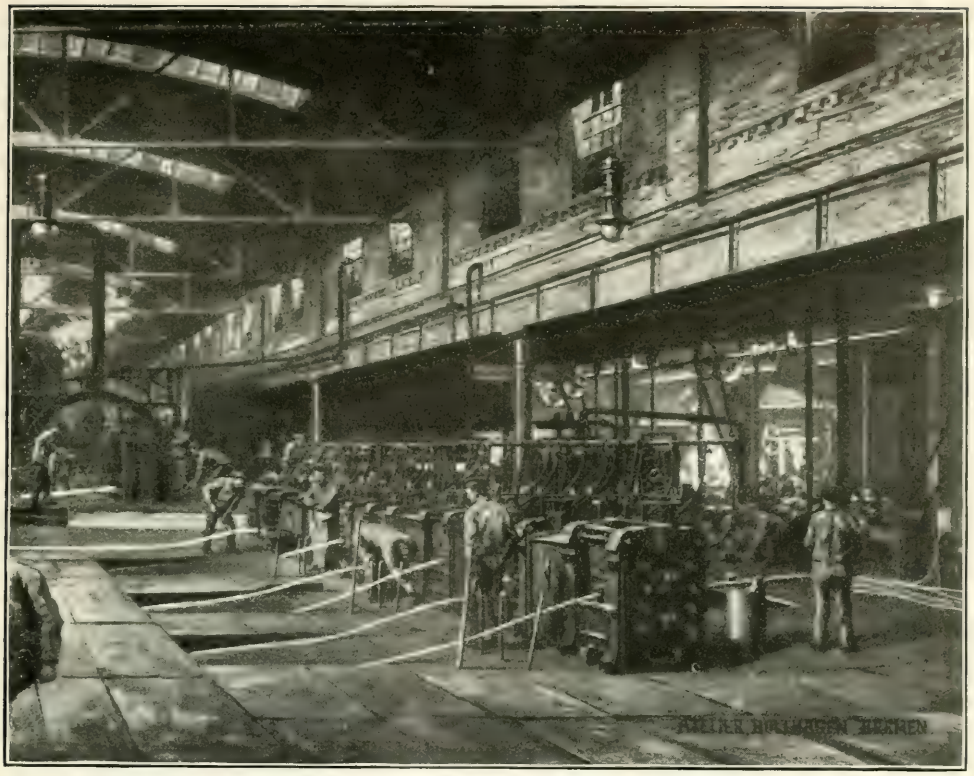


Fig. 8. The Hot-Rolling of Copper Rods at the Linscheid Works of Basse & Selve.

at hand, a small stream should have been used for water power. This is explained by the fact that when such mills were started, large engineering feats had not been performed as they have to-day and the "harnessing" of a large river for power purposes was a matter of exceptional difficulty. Smaller rivers, therefore, that could readily be dammed were used and, therefore, the present large Connecticut brass mills owe their origin to the fact that a small river was available.

It is interesting, therefore, to notice the same kind of rivers near the various plants of Basse & Selve in Germany. They, too, apparently were confronted with the same difficulties in "harnessing" the water as experienced in our own country many years ago.

In the Linscheid Works, copper and brass sheet, rod, tube and wire are manufactured. In Fig. 1 is shown the interior of the sheet rolling mill used for hot rolling copper sheets. This mill is almost a counterpart of sheet copper mills in our own country, and the method of working differs but very little. It may be said, however, that it resembles one of our older copper rolling mills and is not favored with as modern appliances as some of those now known in the United States.

The mill for rolling copper wire, or rather copper rods to be afterwards drawn into wire, is shown in Fig. 8. This mill is on the same floor as the hot copper mill and is side by side with it. The arrangement has apparently been made to save room, and the copper rods, as they issued from the rod mill, are allowed to run under the floor and return for the next pass. This method is followed in some of our American copper wire mills.

The number of employees at the Linscheid Works is now about 700. Seamless tubing and extrusion shapes are now manufactured at this works.

The Schwarzenstein Works, shown in Fig. 9, were founded in 1868 and this is the most picturesque plant operated by the firm. The characteristic river should be noted and the water power made available by it. This plant was, as previously noted, owned by Count Otto von Stolberg-Wernigerode, and had been operated as an iron works up to this time.

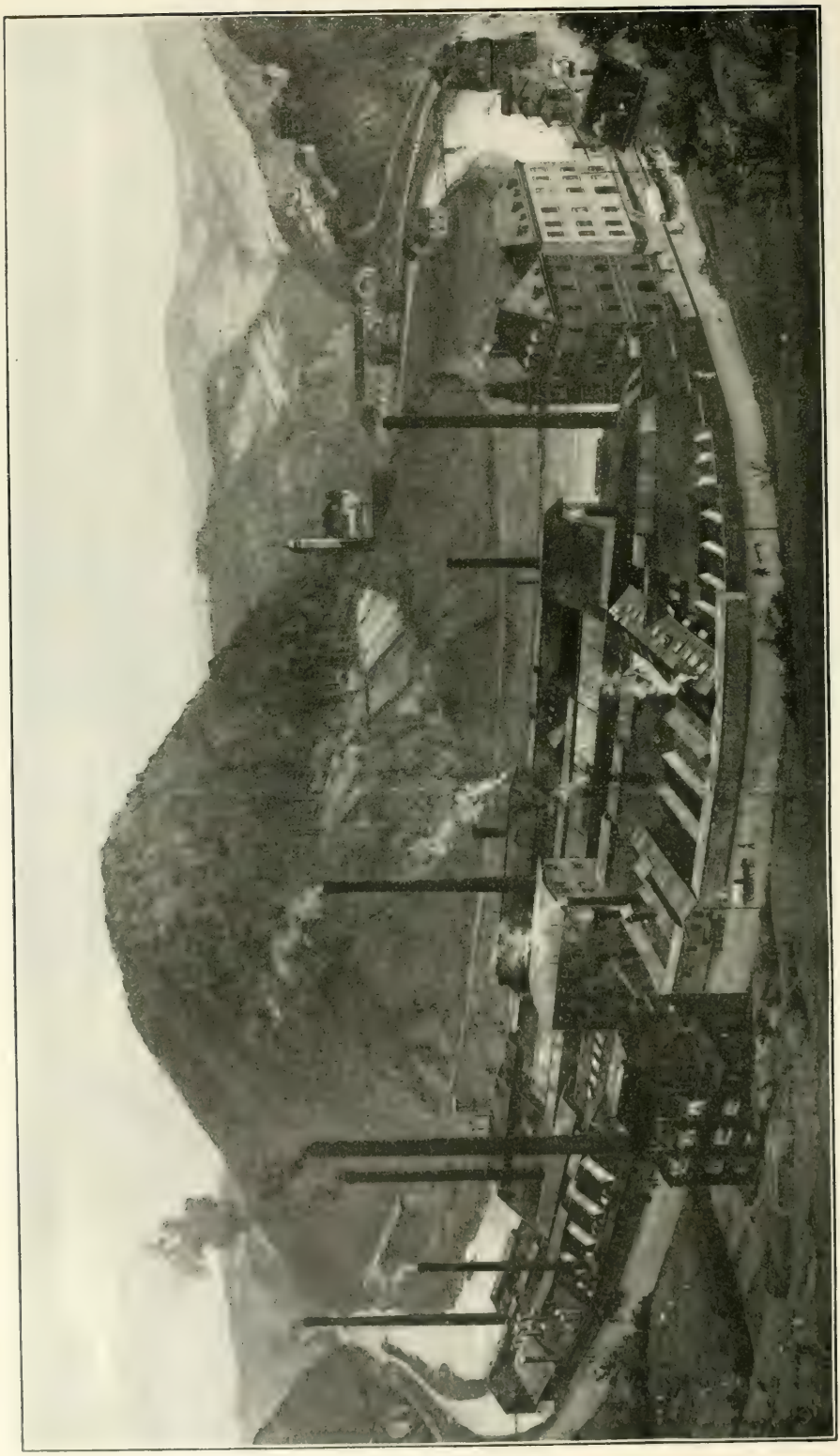


Fig. 9. The Schwarzenstein Works of Basse & Selve. The Smelting of Nickel and Manufacture of Nickel Products is Carried on Here as Well as the Rolling of Brass and Copper.

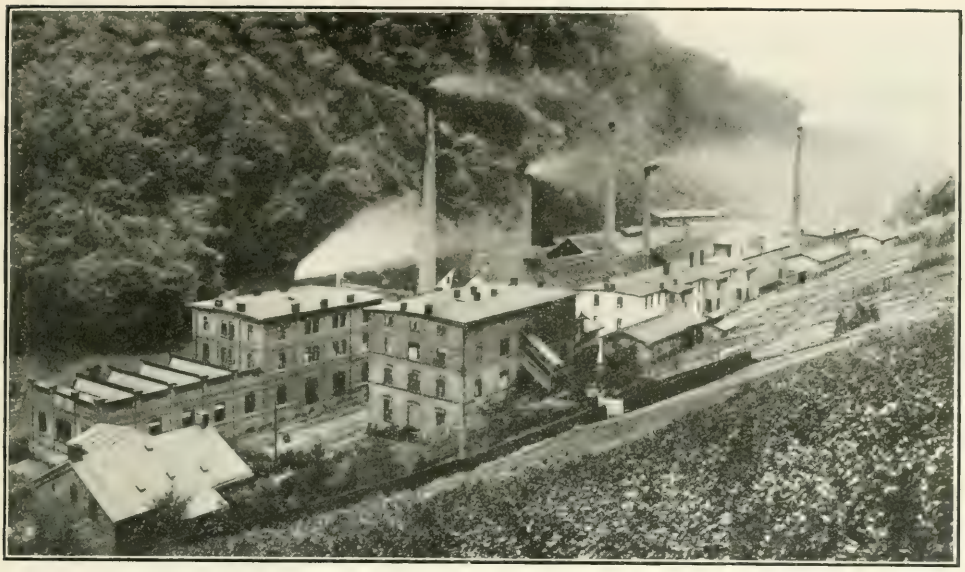
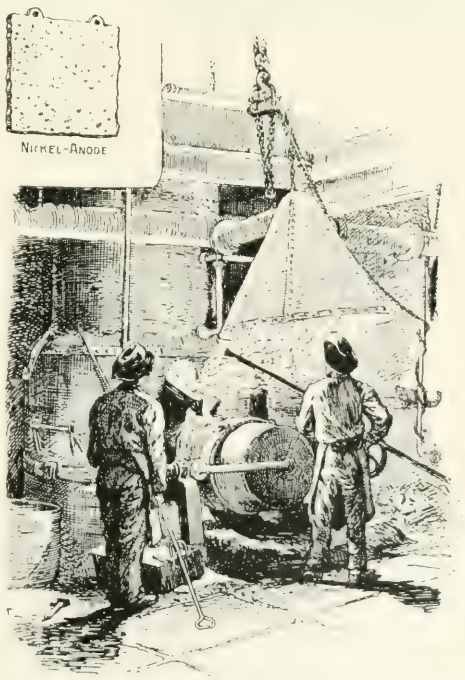


Fig. 10. Baerenstein Works of Basse & Selve. The Oldest of Any of the Plants.

In this works the manufacture of cartridge metal and cartridge shells is carried on. The smelting of nickel is also done at this plant and the manufacture of nickel salts and compounds carried on. Cobalt and cobalt oxide, so extensively used in the coloring of glass and pottery, are produced in connection with the smelting of nickel. Some 1500 tons of nickel are produced per year. The nickel ores used as the raw material are obtained in New Caledonia, a locality that has become famous for producing the best quality of nickel. The fact that the ores from this country are free from injurious foreign metals has been instrumental in giving the nickel made from them the reputation it has had.

It is a noteworthy fact that the cube nickel made by Basse & Selve at one time found its way into the United States for the manufacture of German-silver and was considered of exceptionally high grade. Then tariff difficulties were encountered, and finally with the formation of the International Nickel Co., none was imported and there seems to be an understanding in regard to the matter. German-silver makers say that they are unable to obtain this "German nickel" as they call it, and are obliged to use the domestic quality.

It may be of interest to know that the cube nickel made by Basse & Selve contains manganese, and the good results attending its use, when imported into the United States were undoubtedly due to this metal. At this time the use of manganese in nickel alloys was not a subject understood, but at the



Pouring Nickel Anodes at the Swarzenstein Works.

Fig. 11. The Switzerland Works of Selve & Co. in Thun. Established in 1895.

present time it is extensively employed. Basse & Selve apparently appreciated the value of manganese in nickel for they patented the use of it in their cube nickel. They did not add it as pure manganese as this metal was difficult to prepare at that time. The method they followed was to soak the oxide of nickel cubes, before reduction to metal, in potassium permanganate. The manganese in this material became reduced to metal with the nickel and remained in the cubes ready to perform the good work when made into German-silver and other nickel alloys.

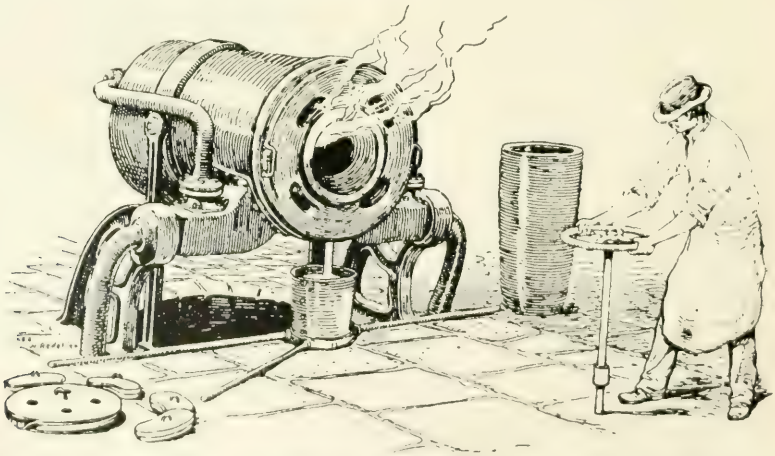


Fig. 12. Special Coke Tilting Furnace at plants of Basse & Selve, Used for Melting Brass, Bronze, Nickel and Aluminum.

At the Baerenstein Works, shown in Fig. 10, is the oldest of any of the plants operated by Basse & Selve. It was started in 1859 as

Fig. 13. Aluminum Foundry at the Linscheid Works. Used Principally for Automobile Work.

an individual mill, and latter amalgamated with other to form the present firm. Here brass, bronze, German-silver and other special alloys are made. Both sheet and wire are produced and the fine qualities of brass, bronze and nickel alloys are manufactured here. It is noteworthy that in 1874 the preparation of pure nickel was begun at this plant, strip metal in 1879, and in 1899, the manufacture of fine wire was commenced.

In 1895 the Swiss works shown in Fig. 11 were established in Thun, Switzerland. This is known as Selve & Co. Here the manufacture of copper, brass and aluminum sheet is carried on as well as the production of wire. Brass and bronze castings are also made and some 300 employees are at work in the plant.

At the Hemer Works, founded in 1880, the manufacture of brass and bronze sheet metal and tubing are carried on. Some 400 hands are employed here. One of the specialties made at this plant is automobile radiators. Condensor tubing is likewise made. One of the features of this works is the use of a special tilting furnace for brass melting and which is shown in Fig. 12. This furnace is

Fig. 14. The Hemer Works of Basse & Selve. In This Plant the Finest Grades of Brass and Bronze Sheet, Wire and Tubing are Manufactured.

of the tilting type and a patent was granted in the year 1897 for it. It is known as the Rousseau furnace. Coke is used for the fuel and the manner of operating the furnace may be appreciated by reference to Fig. 12. This furnace is used in their extensive sand casting establishment shown in Fig. 13, at the Linscheid Works.

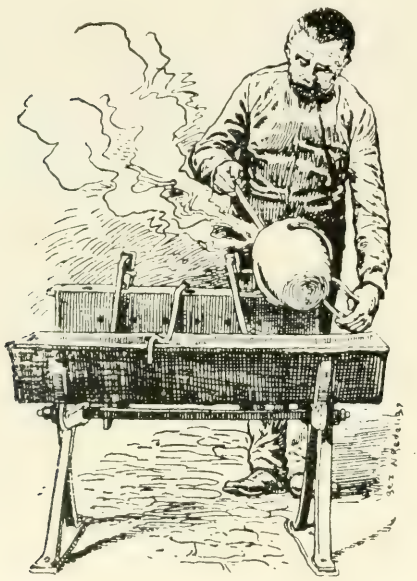


Fig. 15 Method of Pouring Brass at the Hemer Works.

Among the important products of Basse & Selve are brass and bronze sand castings. The brass foundry at the Linscheid Works is shown in Fig. 13. It is a singular fact that a firm of this magnitude should manufacture automobile engines, crank cases, automobile radiators, carbureters, and other similar lines of goods. Nevertheless they do, and do it well. The casting of aluminum for automobile work is one of the principal lines of sand casting and the magnitude of this business was apparently early appreciated. The furnace shown in Fig. 12 is used for melting the aluminum at their foundry.

The nickel coins of the United States in the form of five cent pieces are not pure nickel but are composed of cupro-nickel. The alloy used is 75% copper and 25% nickel.

A New Process for Coloring Aluminum.

The coloring of metallic aluminum has always been an unsatisfactory process, and heretofore it may really be said that no good process for accomplishing it has been known.

A process for coloring aluminum has recently been patented* by Salamon Axelrod of Oberschoneweide, Germany. This process is very simple and consists of treating the aluminum surface with a solution of a cobalt salt and then heating. The heat changes the color of the surface and gradations ranging all the way from a steel gray to a brown and finally black are obtained, depending upon the temperature to which the article is heated.

The cobalt salt used is preferably cobalt nitrate (cobaltous nitrate) and should be either neutral or alkaline. The aluminum article to be treated is dipped into this solution or, if desired, the solution may be applied with a brush. The cobalt nitrate is dissolved in water to make the solution for applying, but the proportions to be used are not given.

After the cobalt nitrate solution is applied to the aluminum, heating is carried out. This may be done in any desired means, by a muffle, by a blowpipe or other convenient methods. The exact temperature to be used is not stated, but is rather low for aluminum melts at practically a very low red heat.

If the heat applied to the aluminum thus coated with the cobalt nitrate is low, then a steel gray color is obtained. A higher heat produces a brown color, and one still higher gives a dead black color.

The black color thus produced on the aluminum by the proper heat, is stated by the inventor to be very durable and not to rub off by friction like other superficial colors obtained by other methods. The black color is also stated to be permanent.

The inventor claims that zinc, tin and other metals may be colored by the cobalt nitrate or other cobalt salts in the same manner.

The object of free cyanide in a plating solution is to keep the anodes clean. It has no other use.

*United States Patent, 1,023,201, Apr. 16, 1912. Assigned to the General Electric Co., of Schenectady, N. Y.

Acetone and Its Properties.

The high price of amyl-acetate and fusel-oil, now so extensively used in the lacquer industry, have called attention to the properties and uses of acetone. Many persons believe that on account of being an excellent solvent for many gums, resins and nitro-cellulose, acetone can be advantageously used as a thinner or as a solvent in lacquers. As will subsequently be explained, this is not followed with much success.

Acetone is a colorless liquid like water with a characteristic smell. The smell of wood alcohol, with which many persons are familiar, is usually due to an admixture of acetone. Chemically pure acetone, however, does not have as strong an odor as the impure or commercial article.

Acetone has a specific gravity of 0.792 and is, therefore, lighter than water. Its boiling point is 56.5° C. (104.9° F.). Its flash-point is 35 F. and is considerably lower than amyl-acetate which has a flash-point of about 70° F. The boiling point of amyl-acetate is also higher than that of acetone and is about 139° C. (282° F.).

Acetone, unlike amyl-acetate (which is a water repellent) mixes with water in all proportions, and it is for this reason that it is not used to any extent in the manufacture of lacquers.

As a solvent for gums, resins and similar materials, acetone is excellent and it dissolves shellac, copal, dammar, elemi, mastic, sandarac and many other resins. It also has the property of dissolving celluloid and most of the nitro-celluloses. It readily dissolves pyroxylin (nitro-cellulose or gun-cotton) as employed in lacquer making as the base. It is quite extensively used in dissolving celluloid to be used as a solution for applying to metal, wood etc.

Acetone is made from crude wood alcohol which is produced by heating wood in an iron retort when a crude distillate called "pyroligneous acid" is obtained. This acid contains acetic acid, wood alcohol (methyl alcohol), acetone and a number of other substances. The pyroligneous acid is again distilled at a low temperature, when the crude methyl-alcohol or wood spirit (crude wood alcohol) distils over, leaving the acetic acid. In order to separate all of the acetic acid, the wood spirit distilling over, is treated with lime which neutralizes the last traces of the acid. The crude wood spirit thus obtained and which consists of wood alcohol and acetone principally, is purified by diluting with water until it becomes milky. It is then distilled over lime which removes the water. A wood spirit is thus obtained which consists of wood-alcohol (methyl-alcohol), acetone and some water. This is now used as a cheap solvent for celluloid in some manufacturing establishments as it costs less than acetone. The mixture of the wood-alcohol and acetone thus produced is treated with calcium chloride which forms a compound with the wood-alcohol but not with the acetone. The compound is not decomposed at the temperature at which water boils, and by distilling the whole at this point, the acetone distils over in a pure condition, leaving the wood-alcohol in combination with the calcium chloride, from which it can subsequently be removed.

Were it not for the fact that acetone mixes with water, it would be more or less extensively used in the manufacture of lacquers, as a solvent. This fact, however, prevents its successful employment. Although it readily dissolves pyroxylin (gun-cotton), and gives a clear solution, when used as a lacquer, unless great precaution is taken, it absorbs moisture from the air and the pyroxylin is precipitated in a white, friable condition. In addition to this feature, the fact that acetone has a low boiling point militates against its use. Could it be used as a solvent, it would be necessary to mix it with a substance with a higher boiling point, as, its rapid evaporation causes the pyroxylin film to become wrinkled and distorted in drying.

Acetone can, however, be used in combination with amyl-acetate as a solvent for pyroxylin and is more or less used in this manner, as well as in combination with other solvents. The fact that it is a "water absorbent" and not a "water repellent" precludes its use as a solvent in the manufacture of lacquers. On the other hand, amly-acetate is a "water repellent" and lacquers made from it do not turn white in damp atmosphere. In addition, it has over twice the boiling point of acetone, and this renders its use in lacquer quite valuable on account of the less danger involved from fire.

Acetone is a valuable solvent and can be used to a good advantage in making various

varnishes, spirit lacquers and solvents. For applying celluloid to steel and iron goods, it is now extensively used as solvent for celluloid. Celluloid, when dissolved in it, forms a varnish that can be applied to metal by dipping or brushing and which dries rapidly leaving the original celluloid.

The Use of Boron for Purifying and Deoxidizing Copper.

While boron has long been known, it has not been until recently that any commercial use has been made of it. It is a constituent of borax (sodium borate) and boracic acid is an oxide of boron. Boron is really a "half metal" as it possesses only imperfect metallic properties, but yet it combines with metals to form alloys.

Ezechiel Weintraub of the General Electric Co., of Lynn, Mass., has carried out many investigations on boron and among the uses found for it has been the purification and deoxidizing of metallic copper. He has patented this discovery (U. S. Patent, 1,023,604, Apr. 16, 1912).

The advantage of the boron, claimed by the discoverer, is as follows:

Boron has a high affinity for oxygen, nitrogen and other gases, but no affinity for copper. At the same time it forms an easily fusible slag of boracic acid.

It has been found, the discoverer states, that if a quantity of boron of from 0.03% to 0.10% be added to molten copper, copper castings free from blowholes are obtained, and the copper has an electrical conductivity of from 95% to 98% Matthiessen standard. The copper also runs freely and fills every portion of the mold. Castings may also be made in iron molds.

When the boron is added to the copper, the portion of it necessary for deoxidizing and purifying is used up, and any excess does not combine with the copper, but floats to the top of the metal as melted slag in the form of boracic acid. This compound, of course, is formed by the oxidation upon exposure to the air. If this does not take place, then the traces of boron left in the copper are simply a mechanical mixture in the copper and have no effect on its electrical properties.

While pure boron may be advantageously employed, it is quite expensive and the discoverer states that boron carbide gives results equally as good as the pure boron and is much cheaper. A still cheaper product is a suboxide of boron, made by treating boracic acid with magnesium.

The boron compound or pure boron, whichever may be used, is placed in the bottom of the crucible and the copper on it. The copper is thus purified during melting. The copper is preferably heated, for casting purposes, considerably higher than its melting point. The melting point of copper is about 1080°C. and the copper may be heated to as high as 1350 C. for pouring small castings. For pouring large castings, a temperature of 1100°C. is said to be suitable. As previously mentioned, the amount of boron to be introduced is from 0.03% to 0.10%.

The discoverer states that boron may be used in the refining of copper in place of the customary poling as it removes the impurities and oxide in the same manner that rabbling and the subsequent poling will do.

The advantage which is claimed for boron in making copper castings is that, while gases and oxide of copper are removed, any excess of boron left does not injure the conductivity of the copper.

A Supermagnetic Alloy.

Iron, nickel and cobalt all have strong magnetic properties. According to a French patent recently issued to P. Weiss (434,886), an alloy of iron and cobalt in the following proportions:

Iron	65% to 70%
Cobalt	35% to 30%

has super-magnetic properties and is useful in the construction of electromagnetic apparatus. The magnetism of this alloy at saturation is stated to be 10 per-cent greater than that of pure iron.

Platinum, when exposed to a high temperature for a considerable time, becomes brittle so that it has the appearance of galvanized iron.

Bitumen is another name for asphaltum, but is frequently employed to designate the purest and most light-sensitive grades used in etching.

Standard Brass Foundry Mixtures and Method of Making Them.

By Erwin S. Sperry.

(Continued from Page 121, Apr. 1912)

Molds.

Large quantities of bronze molds are used for casting articles in soft metal. Britannia-metal, pewter, antimonial-lead, solder, spelter and similar soft metal alloys are cast in bronze molds. The castings come out in a finished condition. The object of a metal mold of this description, of course, is to allow a large number of castings to be made in the same mold. Were such castings made in sand, they would cost very much more and would be rough. The castings from the metal mold are only limited in smoothness and fineness of detail by that of the mold itself.

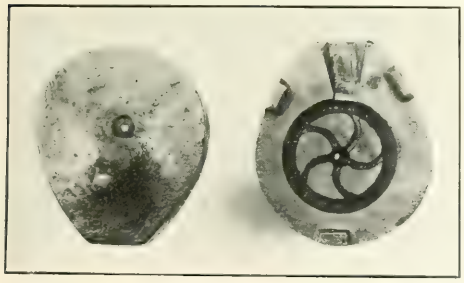


Fig. 1. Bronze Mold for Casting Soft Metals, Showing Its Character.

The requirements of a bronze mold mixture for casting soft metals are somewhat severe:

1. It must be sufficiently hard to stand considerable rough handling without becoming distorted.

2. It must be capable of producing a casting of the finest kind, true to detail and smooth.

3. The casting must be suitable for use as a mold and there must be no segregation in the form of tin spots or lead, to which the metal would adhere in the mold.

4. The metal must be suitable for chasing as in finishing the casting for use as a mold, much work of this character has to be done upon it. A metal too hard or too tough does not chase well and the cost of finishing becomes too great.

The following mixture is suitable for making molds for use in casting soft metals:

Copper	91 lbs.	or 910 grams
Tin	6 lbs.	or 60 grams
Zinc	2 lbs.	or 20 grams
Lead	1 lb.	or 10 grams
Total....	100 lbs.	or 1000 grams

New metals of the best quality should be used in this mixture. The amount of lead is kept low in order to prevent any separation. The face of the mold should always be cast down and the mold faced with Windsor-locks sand and skin dried. The idea is to obtain as smooth a surface as possible so that the minimum amount of chasing only will be required.

Red Metal Plumbers' Goods.

So few concerns make red-metal plumbers' brass goods at the present time that they are conspicuous. While in some instances a yellow brass article may be just as good as one made of red metal, in the majority of instances the red one is to be preferred as it is harder and does not corrode or pit at the seat like yellow brass. A few concerns making plumbers' brass goods use red metal for most of their goods and as they have a reputation, they are able to obtain the necessary price. A red metal faucet, cock or other article can usually be relied upon to be high grade for the reason that the concerns making them can-

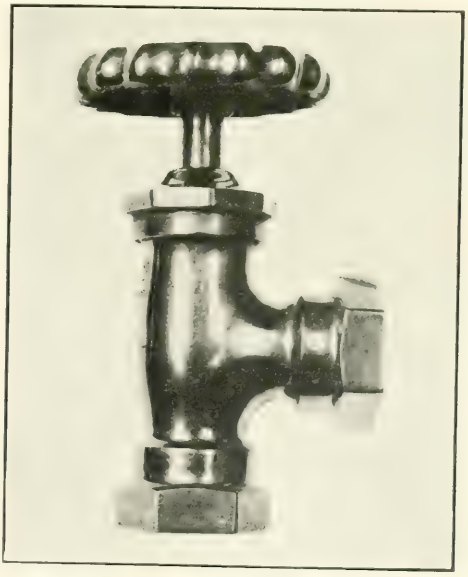


Fig. 2. High Grade Plumbers' Brass Goods Made of Red Metal.

not afford to jeopardize their good name by putting out anything but the best quality.

Plumbers' brass goods made of red metal are usually made of a somewhat inferior grade of this material. There is no occasion for putting in as good a mixture as that used for steam goods as they do not have to stand the pressure. Less tin and more zinc can be used. Too much lead should not be used as it interferes with the production of a good, polished surface. The following mixture is suitable:

Mixture for Red-Metal Plumbers' Brass Goods

Copper	84 lbs.	or 840 grams
Tin	4 lbs.	or 40 grams
Zinc	8 lbs.	or 80 grams
Lead	4 lbs.	or 40 grams
Total....	100 lbs.	or 1000 grams

Scrap metals of good quality can be used for making red metal plumbers' brass goods, and a considerable cheapening of the product can there be made. Makers of plumbers' brass goods are among the largest users of scrap metals.

Keys.

Sheet steel is now so extensively used in making keys that the quantity of cast bronze keys now made is quite small. There is still a demand, however, for bronze keys to match cabinet hardware and it is for this purpose that they are used almost exclusively. A strong bronze is required and one than can be drilled easily. Beyond this there is no requirement as the color usually takes care of itself. Any good tin bronze that is stiff enough and not brittle is sure to have the necessary bronze color. The following mixture will be found satisfactory:

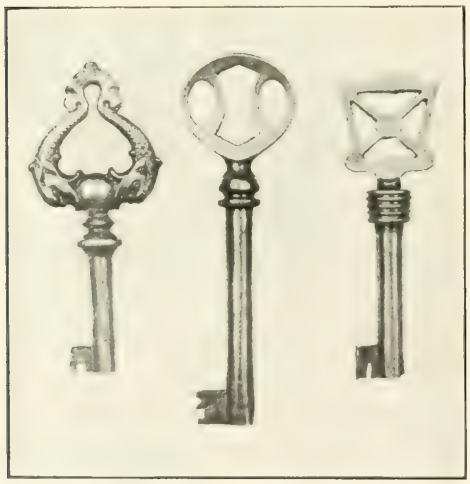


Fig. 3. Keys Cast from Bronze Key Mixture.

Mixture for Keys.

Copper	83 lbs.	or 830 grams
Tin	10 lbs.	or 100 grams
Zinc	5 lbs.	or 50 grams
Lead	2 lbs.	or 20 grams
Total....	100 lbs.	or 1000 grams

Hydraulic Metal.

Heavy pressures are now used so extensively in manufacturing that the demand for bronze castings to stand the pressure is now greater than ever before. Let it be known, however, that in making a casting to stand heavy pressure, the mixture is of no more importance than the molding or the melting of the metal. It is possible to make good castings for this work out of poor metal, provided the molding, melting and pouring are well done. It will not suffice to use the best mixture for the purpose, but the greatest care and knowledge are required in making the mold and in melting and pouring the metal. Unless this is done, no mixture will answer.

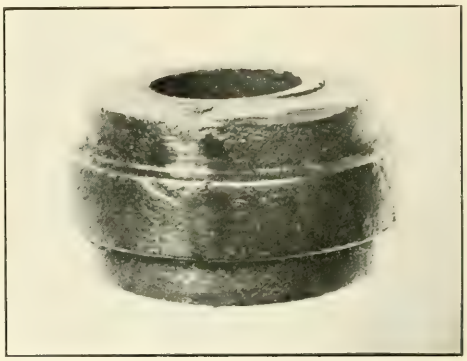


Fig. 4. Casting Illustrating Application of Hydraulic Bronze Mixture.

It is a mistaken idea in making castings for hydraulic work to believe that the strength of the metal is important. Designers of the casting allow a very large factor of safety in designing the work, and for this reason any of the bronzes are usually strong enough. What is required is a bronze that is hard and can be cast well. The leakages are caused, almost exclusively, by dross and blowholes

and not by the grain of the metal. The following mixture is excellent for hydraulic work:

Mixture for Hydraulic Castings

Copper	85 lbs.	or 850 grams
Tin	10 lbs.	or 100 grams
Zinc	2 lbs.	or 20 grams
Lead	3 lbs.	or 30 grams
Total	100 lbs.	or 1000 grams

The lead in the bronze has a two-fold purpose. First it allows the bronze to be machined readily. Second, it gives a more solid casting than without it. It has been found that the lead "fills up the pores" of the bronze, so to speak, and prevents sweating under pressure. This can probably be explained by the fact that the lead separates out in minute particles which fill up the spaces between the crystals of the copper and tin alloy.

Screen Plates.

Screen plates are used in the manufacture of paper by the sulphite process for straining the pulp and allowing only material of a certain size to pass through. A small screen plate is herewith shown but large ones are used and have a large number of slots cut in them. The requirements of a screen plate

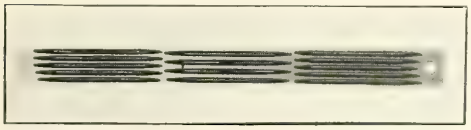


Fig. 5. Screen Plate Showing Manner of Cutting the Slots.

are that the mixture shall not be readily attacked by the sulphite liquor mixed with the paper pulp, and that it shall be sufficiently soft to allow cutting the slots in the surface with a thin saw revolving at a high speed. This saw is only about 0.01 in. in thickness and unless the bronze cuts exceptionally freely, it will break. The bronze, therefore, must contain a large amount of lead, and when present it not only allows very free cutting, but renders the metal more non-corrosive and less readily attacked by the sulphite liquor. The following mixture is used:

Mixture for Screen Plates

Copper	85 lbs.	or 850 grams
Tin	5 lbs.	or 50 grams
Zinc	2 lbs.	or 20 grams
Lead	8 lbs.	or 80 grams
Total	100 lbs.	or 1000 grams

Bells.

To make a good bell, requires a good mixture. While it may be possible to make a good looking bell from an unsuitable mixture,

Fig. 6. Bell Casting Illustrating Bell Mixture.

it will not have the desired tone and frequently will not ring at all. Bell mixtures are all composed of copper and tin, and by varying the amount of tin, the hardness may be readily increased or decreased as may be desired. There are two good bell mixtures that are used for large and small bells. Large bells are made of a little softer mixture than the small bells for the reason that they are more apt to break on account of rough usage. The following mixtures are standard for cast bells:

Mixture for Large Bells.

Copper	85 lbs.	or 850 grams
Tin	15 lbs.	or 150 grams
Total	100 lbs.	or 1000 grams

Mixture for Small and Medium Size Bells

Copper	80 lbs.	or 800 grams
Tin	20 lbs.	or 200 grams
Total	100 lbs.	or 1000 grams

More depends upon the mixture in making a successful bell than upon the molding. Copper and tin mixtures alone do not cast well upon the first melt and it is recommended to melt the bronze twice. This gives a more homogeneous mixture and one that produces a better casting. It is preferable also to add a little phosphorus in the form of phosphor-copper to purify the mixture oxide. Zinc can be used, but the phosphorus is better. A very small amount only must be used or the tone of the bell will be affected. Large quantities of phosphorus deaden it. The use of 2 oz. of phosphor-copper to each 100 lbs. of bell mixture is recommended.

The tone of a bell is greatly improved by the presence of iron in it. The iron hardens the mixture and gives a close grain metal. While the iron can be added directly, such a method is rather uncertain and some of the iron may not enter the mixture. The best method of introducing the iron is by means of yellow prussiate of potash (which contains iron). This is used as a flux on the bell metal when melted. It not only introduces the iron, but purifies the metal from oxide, and when used, no phosphor-copper should be added. It is unnecessary. The following is the flux recommended:

Yellow Prussiate of Potash	1 lb.
White Sand	1 lb.
Soda-Ash	1 lb
Borax	¼ lb.

This flux is added to the copper when it begins to melt and allowed to remain in the crucible. About 2 lbs. are used to each 100 lbs. of the bell metal. Before pouring, the flux is skimmed off. If the flux is allowed to stay on the bronze while it is being melted, about 0.50% of iron is introduced into it. It has been thoroughly demonstrated that this amount of iron greatly increases the tone of the bell.

(*To Be Continued*)

The name "tungsten-bronzes", frequently noticed in technical literature, is applied to bronze colors obtained on textile goods by dyeing with a number of salts containing tungsten. The term, while indicating tungsten alloys, has no connection with them as the tungsten compounds used for the dyes are sodium tungstates.

Brass and Bronze Plating Solutions and How to Make Them.*

Fifth Paper.†

Making the Solution.

While theoretically a brass or bronze solution can be made up by weighing out a certain quantity of cyanide and a certain amount of the carbonates of copper and zinc, and then dissolving the carbonates in the cyanide, it is very difficult to carry out in practice and is not to be recommended. It may seem singular, at this age of accuracy, to use "rule of thumb" methods, but experience has demonstrated that it is far better and simpler. In reality, however, the method advocated and explained in this article for making up the solutions is more of a combination of the scientific and the "rule of thumb" methods as will subsequently be appreciated. If attempts are made to make up the solution by taking given quantities of the cyanide and the carbonates, then the variation in the strength or dissolving power of the cyanide is not considered; and this is a very important feature for the reason that the amount of free cyanide necessary for the proper working of the solution cannot be regulated. There is either obtained none at all, or too much.

The best method of making up the solution is, briefly speaking, as follows:

1. Make up a solution of the cyanide in water.

2. Dissolve in it all the carbonate of copper it will take up so that there will be no free cyanide.

3. Make up another solution of the cyanide in water.

4. Dissolve in it all the carbonate of zinc it will take up, so there will be no free cyanide.

5. Add to the copper solution, about 4 oz. of cyanide to every gallon of the solution. This is for free cyanide.

6. Try this copper solution thus made up and while running, add to it a little at a time, some of the zinc solution. The effect should be noted. As it is first added in small amounts, the color of the copper deposit does not change, and as more is introduced it be-

*Continued from THE BRASS WORLD, April, 1912, page 129.

†These papers will be continued.

gins to deposit bronze, then a light bronze and finally as more is added a green brass. At last a true, yellow brass is formed. In this manner the right amount of zinc necessary can be gauged. If the anodes do not remain clean, then a little more free cyanide should be added.

Neither scientific investigation nor experience has demonstrated exactly what proportions of copper, zinc or free cyanide should be in a brass solution, so it is made up by the "cut and try" method. One would imagine that if the copper and zinc were present in the solution in the proportion of 2 parts of copper and 1 part of zinc, that a yellow brass must surely deposit. This is not the case for the amount of free cyanide, strength of the current, ammonia and other substances in the solution have a tendency to alter the proportion of the copper and zinc deposited in the brass. The "cut and try" method, therefore, is the favorite one for making up a brass or bronze plating solution.

The making of the solution may be divided into various steps. The first step is, in reality, the making of a good cyanide solution. It is as follows:

Making the Copper Solution.

Make a solution of the cyanide to be used in water in the following proportions. It makes no difference whether a straight potassium cyanide, the double potassium and sodium cyanide, or the straight sodium cyanide. The flexibility of the process of making is such that these factors do not enter. On this account, the term "cyanide" is used to designate any commercial cyanide that can be used for making up the solution. Dissolve the cyanide in water in the following proportion:

Water	1 gallon
Cyanide	1 lb.

The dissolving is preferably carried out without the use of a steam pipe for heating the solution. The best temperature is when slightly warm, say about 100° F. The object of using a comparatively cold solution is that it becomes warm when the carbonates are added through chemical action, and if the solution is hot at the beginning, it becomes too hot when the carbonate of copper is dissolved in it. In addition, cyanide is more or less decomposed by heat.

If the solution of cyanide in the water is hot when the carbonate of copper is added, then, as previously mentioned, there is additional heat generated and this is frequently followed by the formation of a black copper compound. The carbonate of copper apparently changes to a black compound, and this is not very soluble. Therefore, if the solution is too hot when the carbonate of copper is added, this black, insoluble copper compound is formed which prevents the successful making of the brass or bronze bath.

A good method of dissolving the cyanide, is to place it in a stoneware dip basket and hang it from a rod on the top of the tank. The heavy solution formed as the cyanide dissolves, sinks, leaving the lumps free to be dissolved by the water. In this manner the cyanide will dissolve more or less rapidly. If desired, however, the cyanide can be dissolved in a pail or tub in hot water and then added to the tank. It is not advisable to place the lumps of cyanide in the bottom of the tank. When all the cyanide has been dissolved, the solution should be thoroughly mixed with a wooden paddle.

The solution made by dissolving the 1 lb. of cyanide in 1 gallon of water will stand about 8° Beaumé.

To this solution of cyanide in water, add carbonate of copper a little at a time with stirring. The plastic carbonate is preferable although, of course, the dry, if finely powdered, dissolves readily. When first added, the solution becomes purple and the carbonate then dissolves. Now add a little more of the carbonate and stir until it dissolves. *Continue to add the carbonate until no more will dissolve.* The object is to obtain a solution of carbonate of copper in cyanide that will be saturated. In other words, so that no more carbonate will be taken up by it. While a slight excess of the carbonate does no harm, a large amount beyond that which will dissolve should not be added. When properly carried out, the solution will be slightly green when stirred, and upon allowing to stand, a very slight amount of green carbonate of copper will be found on the bottom of the tank or vessel containing the solution.

The copper solution thus obtained contains no free cyanide and in order to have it work satisfactorily, some must be added. To the solution add as follows:

The Copper Solution	1 gallon
Cyanide	4 oz.

The solution will, therefore, contain 4 oz. of free cyanide per gallon. It is always slightly reddish on account of the presence of iron, but this does no harm and need not be filtered out.

This copper solution now made and containing free cyanide is used for the base of the brass or bronze solution. After the carbonate of copper has been added to the cyanide to saturation so that no more will be taken up, the solution will stand about 13° Beaumé. After the 4 oz. of free cyanide have been introduced into it, it will then stand about 15 or 16 Beaumé.

Making the "Stock Zinc Solution"

The zinc is added to the copper solution, previously made, in the form of a "stock zinc solution". This is kept for replenishing the brass or bronze solution as well as for making it. To make the stock zinc solution proceed as follows and take:

Water	1 gallon
Cyanide	2 lbs.

Dissolve the cyanide in the water in the manner previously mentioned, and in it dissolve all the carbonate of zinc it will take up. The carbonate of zinc should be in the plastic form if possible as it dissolves very much more readily than the dry material. Proceed in dissolving the carbonate of zinc in the cyanide in the same manner as in dissolving the carbonate of copper. When no more will be taken up, stop.

The idea is the same as in the case of the copper solution, viz: To obtain a solution containing *no* free cyanide. If the point is reached where no more carbonate of zinc will be taken up, then a zinc solution of cyanide will be had that is saturated and contains no free cyanide at all. It should be borne in mind that this needs no free cyanide in it.

Making the Bronze or Brass Solution.

The making of the bronze or brass solution is now a very simple operation.

Take the copper solution, as previously made and containing the free cyanide and start plating with it in the regular manner. See if it gives a good copper deposit and if it does, then it is ready for treatment.

To this copper solution, while it is actually being used for plating, add some of the stock zinc solution, stir up thoroughly and try on a piece of work. When only a small quantity of the stock zinc solution is introduced, there is no change in color. As more is added a bronze deposit is obtained. A greater quantity gives a light bronze, and then, after more has been introduced, a green brass. Finally, when still more has been used, regular yellow brass will be produced. By the use of this stock zinc solution, containing no free cyanide, the free cyanide in the copper solution is not disturbed, so that no matter how much of the zinc solution is used, the quantity of free cyanide in the brass solution remains the same.

In adding the stock solution and trying the result, care should be used not to add too great an amount at a time; but try on the work after each addition until the right shade has been obtained. In this manner it will be appreciated that either a bronze or brass solution can be made, and of any shade that can be produced. The method is independent of variations in strength of materials or other uncertain factors.

The Free Cyanide.

The amount of free cyanide in a brass or bronze solution cannot be determined except by the manner in which it works. The kind of anodes, whether copper, brass or bronze, the strength of current, the temperature of the solution, and a number of other things determine the quantity of free cyanide that must be present, and each case requires a different amount. This amount, however, may readily be determined by the manner in which the anodes work. If they coat over very quickly while the current is running, then it indicates that there is altogether too little free cyanide present. If, on the other hand, they remain very clean and bright indefinitely, there is probably too much free cyanide present and the deposit is apt to be thin and difficult to produce as a heavy coating. The best condition is when the anodes remain clean for several days with ordinary working, but finally coat over. These points, however, should be readily determined in working, and the operator can add more free cyanide as the occasion demands.

Strength of the Solution.

The strength of the solution made up in the

proportions previously given will be from 18° to 20° Beaumé and can be used for many kinds of work. Barrel plating may require a stronger solution, while some kinds of work may require a weaker bath. These points will be taken up in subsequent papers. By making up the solution in the manner described, however, it can be reduced with water by simple addition to the desired degree. The solution as given, is about as strong as needed for ordinary work. The effect and advantage of additional ingredients, such as bi-sulphite of soda or carbonate of soda will be taken up in subsequent papers.

Replenishing the Solution.

In working a brass or bronze solution, the color of the deposit is the "barometer" of the operation. If, when a yellow brass is being plated, the color begins to fall off and approaches a bronze, then more zinc is needed. All that is necessary to do is to add the stock zinc solution so that the color is brought back to the desired shade. In this manner the solution may be maintained in a uniform working condition and without disturbing the free cyanide in it. This is a great advantage for the reason that if the solution is replenished by the addition of carbonate of zinc directly to it, the free cyanide is neutralized partially or entirely and the bath will then work irregularly and will require further doctoring to bring it back to the normal condition. By all means use the "stock zinc solution" for replenishing a brass or bronze plating solution.

(To Be Continued.

A Method of Inlaying Celluloid with Metal.

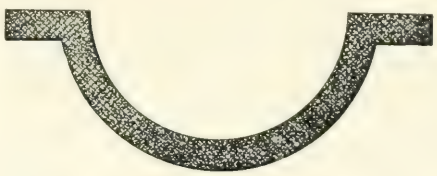
It is frequently desired to inlay celluloid or similar material with metal. An inventor has patented the following process for doing it which greatly simplifies the operation.

A sheet of metal, with the design to be inlayed painted on it with a resisting paint, such as asphalt, is fastened to the celluloid. Exact registering can thus be obtained. The whole is then placed in an etching solution and the metal etched clear through where it is not stopped off with the paint. The design is, therefore, left on the celluloid. It is then pressed into the surface forming the desired inlay.

A Novel Method of Making a Graphite Babbitt-Metal.

A novel method of making a graphite babbitt-metal has been patented by Raymond T. Cole of South Portland, Maine (U. S. Patent, 1,022,465), April 9, 1912. The process is as follows:

Graphite in a finely divided condition and suitable for luberication is used. It is preferably in the form of small flakes and such graphite is sold for lubricating purposes. This graphite is then placed in a solution of sulphate of copper and pieces of metallic zinc immersed with it. The whole is stirred and the particles become coated with copper by



Manner of Making the Graphite and Babbitt Bearing.

the galvanic action. If a heavier copper deposit is desired, it may be accomplished by electrodeposition, depositing it from a cyanide copper or acid copper plating solution by means of the electric current.

The graphite thus coated with copper is washed with water to remove the excess of copper sulphate solution, after which it is dried.

The copper plated flakes of graphite thus made are stirred into molten babbitt-metal in the desired proportion. The babbitt-metal should be slightly above its melting point. The fact that the flakes of graphite are each coated with copper, causes them to become immediately "wetted" by the babbitt-metal and a thorough mixture results without the graphite floating to the top as it does when added without first being coated with copper. The copper, having a higher melting point than that of the babbitt-metal, does not melt but remains in suspension. There is no separation by floation.

The mass of babbitt-metal containing the graphite in this condition is improved, the inventor says, by subjecting it to pressure while it is solidifying. Therefore, the babbitt-metal

is poured into a mold and pressure applied while cooling. A bearing is thus formed which contains particles of graphite distributed through it and which increases its value as a lubricating material.

Proposed Specifications for Solder.

The following specifications for soft solder have been submitted to the American Chemical Association by H. J. Skinner of Arthur D. Little, Inc., Boston, Mass., the well known consulting and industrial chemist. Mr. Skinner acted as chairman of the general committee. The report is as follows:

No attempt has been made to cover special solders, since their composition is necessarily dependent upon their specific uses and the total amount used is small as compared with the more common types. The requirements for fine solder were formerly and are now in many cases 50 per cent. tin and 50 per cent. lead. Careful service tests carried out by a very large consumer of solder have clearly demonstrated that a solder containing 45 per cent. tin and 55 per cent. lead is entirely efficient for general service, while the cost is materially less.

The composition specified for wiping is practically standard among all large users of this material.

As specifications of this nature should be adapted to the needs of the greatest number, an attempt has been made to insert such requirements as would guarantee a satisfactory product, but, at the same time, not needlessly limit the method of manufacture. Copper and zinc have been entirely prohibited, as the former affects the flowing qualities, while the latter produces brittleness. Antimony, however, up to a small percentage, is not detrimental and has not, therefore, been entirely prohibited. The other common impurities are not harmful if present in but small amounts. The requirements, therefore, allow the presence of other metals other than lead or tin (excepting copper and zinc) up to 0.5 per cent. It is the opinion of the committee that this will allow the use of old metal of a suitable nature, but will prevent careless manufacture or wilful adulteration.

General Description.

The solder desired under these specifications is a homogeneous alloy of lead and tin, uniform in composition, containing no zinc or copper and as free from every other substance as possible.

Rosin flux solder shall consist of a shell of solder inthe form of a wire, containing a core of rosin flux. Mineral and other non-resinous fluxes shall not be used.

The quality of the material used and the methods of manufacture shall be such as to insure for the completed solder the properties called for in these specifications.

Requirements.

The composition of the various solders supplied under these specifications shall be as given in the following table, in which column A denotes the quality of the solder, column B the minimum per cent. of tin allowed, column C the per cent. of lead allowed, and column D the maximum per cent. of metallic impurities other than copper and zinc.

Composition of Various Solders.

	A.	B.	C.	D.
Fine solder (bar solder)	...	45	About 55	0.5
Wire solder	.....	45	About 55	0.5
Rosin flux wire solder	.....	45	About 55	0.5
Wiping solder	.....	40	About 60	0.5

The rosin core used in rosin flux wire solder shall be of commercially pure rosin and shall form not more than 6 per cent. nor less than 3 per cent. of the total weight of the finished product.

Inspection.

Each shipment shall be inspected and weighed. Drillings taken from any portion of each lot of solder shall be analyzed, and the results of the analysis shall be considered to represent the composition of the lot. Analyses shall be made in accordance with the standard method attached to and hereby made a part of these specifications.

Method and Shipment.

The completed solder shall be furnished in such form and weight and with such marks as may be specified. Any shipment which fails to meet the requirements hereinabove specified may be rejected and returned, the contractor paying freight charges both ways

New Process for Making Galvano-Plastic Articles.

The usual method of making galvanoplastic articles is by depositing copper, from an acid copper plating solution, on to gutta-percha, wax, plaster or other substances. Any of the materials employed are open to objections. One of these is that plaster and wax are fragile, while glues and gelatines change their form too much in drying. Gutta-percha is difficult to use in certain forms where pressure cannot be applied.

According to a German inventor, Carl Bensinger of Mannheim, Germany, who has recently patented the process, celluloid offers the following advantages as a base material for galvanoplastic work:

1. It can be pressed or blown into any desired shape and gives an absolutely true reproduction of the original.

2. The celluloid figure, being hollow and very thin, is very light and easily handled.

3. Celluloid is acid proof, unbreakable and unchangeable, and can, if it is desired, be easily removed from the copper deposited by the aid of dissolving agents or fire.

The process of making the model, upon which the copper is to be deposited, is as follows: The selected model is divided into any number of parts, so that all the undercut lines of the original can be produced. There is no limit to the number of these parts, and a suitable mold is made in order to press or blow out these parts. The hollow parts thus produced are united, which may easily be done on account of the adhesiveness of celluloid. There has now been produced an exact copy of the original and it is ready for the electrodeposition.

The copper is deposited upon the celluloid in the usual manner, either on the outside or the inside or both. When the desired thickness has been obtained in the copper bath, the celluloid is either dissolved out by acetone, amyl-acetate or other solvent, or by heating it and burning out.

The copper is deposited by first coating the surface of the celluloid with graphite, in the same manner that electrotypes are produced, and then "striking" in a solution of copper sulphate containing no acid. Iron filings are brushed over the surface while in this solution and a very thin film of copper deposits all over the graphite rendering the whole a good conductor. The article is now transferred to the regular copper sulphate solution, containing a little free acid, and the copper deposited upon it by the electric current.

Specifications for Babbitt-Metals.

The Committee on White-Metals appointed by the *American Society for Testing Materials* held a meeting in the Hotel Astor, New York City on March 28th. and the following specifications for babbitt-metals were proposed:

1.—Commercially designated "Soft-Genuine", having the composition adopted by The Society of Automobile Engineers, Specification No. 17, Babbitt-Metal No. 1.

2.—Alloy which is generally used in street railway service known as G. E. 17 alloy. This is closely analagous to Specification No. 18, Society of Automobile Engineers, Babbitt-Metal No. 2.

3.—Intermediate grade of babbitt-metal, containing lead and copper.

4.—A true lead base babbitt-metal containing tin, which is analagous to many of the widely advertised brands of babbitt.

5.—What is commercially known as No. 4 Babbitt, a straight lead and antimony alloy.

No.	Tin	Antimony	Copper	Lead
1.	80%	7%	4%	none
2.	83 1/3	8 1/3	8 1/3	none
3.	50%	12%	1%	37%
4.	7%	17%	none	76%
5.	none	10%	none	90%

In connection with these alloys it was proposed to make investigations upon the heat treatment of them.

The foregoing specifications are only tentative and were suggested by the Committee as a working base for further discussion.

The method of producing fine brass castings in the leading brass centers of the United States, is to face the mold with Windsor Locks sand, then skin dry the mold and finally smoke the face with a gasoline torch. Except for undercut work, it is not customary to dry the mold clear through, or to use French molding sand. The latter is employed for molding statues and similar work requiring false cores.

New Composite Sheet Metals.

The high price of tin has caused much experimenting to be done with the endeavor to replace it with a cheaper metal. This is particularly true in the case of britannia-metal, pewter or other soft metals with a tin base. The Hoyt Metal Co., of St. Louis, Mo. and 111 Broadway, New York City, the well known manufacturers of soft metal alloys have been experimenting for some time with this end in view and have finally succeeded in producing some very interesting compound soft metals. These metals are doubly interesting for the reason that they have an aluminum core.

Three different compound metals have been placed on the market. They are as follows:

Hoyt-Silver

This is a britannia-metal with a core of aluminum. It weighs 79% of britannia-metal. It is stated that it will make silver plated ware that is cheaper, stiffer, lighter and stronger than that made from regular britannia-metal. The use will save from 4 to 5 cents per pound. It is supplied in a hard or soft condition ready for use. Sheet as thin as No. 26 B. & S. gauge is supplied and in widths up to 24 inches.

Hoyt-Silver is not suitable for making toilet-ware, but a new material, called "two-ply britannia" is supplied for this purpose.

Alumintin

This is sheet aluminum faced on both sides with pure, block tin. It can be soldered and electroplated with no difficulty. Its specific gravity is 3.34. The advantage of this light material that can be worked like copper will readily be appreciated, and the value of its capability of being soldered or plated should not be under-estimated. Sheet in thickness and widths furnished in "Hoyt-Silver" are supplied to the trade.

White-Copper Stamping Metal.

This is sheet aluminum faced on both sides with an antimonial lead alloy. It is cheaper and more easily worked than copper or brass, and is stiffer and harder than antimonial-lead. For the manufacture of badges, fobs and medals it will find an extensive use, replacing antimonial-lead for this purpose. The specific gravity is 5.10. It is easily stamped into intricate designs without annealing. No wear on the dies will be found and it can readily be electroplated. The same thicknesses and widths of sheet metal that are supplied in the other metals, are furnished in this.

The Hoyt Metal Co. say that these metals are made by a rolling process which they do not wish to make public at the present time.

Increasing the Hardness of Silver and Gold by Means of Titanium.

According to Auguste J. Rossi of the Titanium Alloy Co., of Niagara Falls, N. Y., silver and gold may be hardened by means of titanium so that articles, such as spoons or forks, for example, will show a much longer wear.

Titanium has the property of hardening metals and it imparts hardness to both gold and silver. The use of titanium in these metals has been patented by the aforesaid inventor.

The method of adding the titanium to sterling-silver or gold is as follows: An alloy of copper and titanium is first made up. This should contain 99% copper and 1% of titanium. This alloy of copper and titanium is then used as the alloy for making the sterling-silver or the alloyed gold. If used in sterling-silver the amount of titanium which is contained in the final product is minute and may be expressed as follows:

Silver	925.00 parts
Copper	74.25 parts
Titanium	0.75 parts

The amount of titanium in the sterling-silver is, therefore, very small. It is claimed that, in addition to hardening the silver, the titanium purifies it.

Blowholes in brass or bronze castings never come from wet sand, but from the unskillful melting of the metal. Metal that has been overheated in melting, has not been kept well covered with charcoal, or has been allowed to remain in the fire for a long time after it has melted, absorbs gases from the products of combustion. When the metal cools in the mold, therefore, these gases are expelled and blowholes form. Pinholes and blowholes are the same thing, except that one is larger than the other.

A New Class of Rolled Shapes in Steel and Bronze.

A new class of rolled material has recently made its appearance upon the market and is in the form of the shapes herewith illustrated. These shapes are now being manufactured by the United States Metal Products Co., 203 West 40th. St., New York City and were designed primarily for use in the construction of fire-proof buildings. In such construction it became necessary to employ metal windows, doors and trim in order to render the whole fire-proof and this company started to manufacture the various shapes required. These shapes can be used for either covering wood, or for the complete article itself without the use of any wood.

The shapes are made of thin sheet steel or bronze, as may be required, and in long lengths or short pieces cut to desired size. The company recently installed a rolling mill for rolling the steel and bronze. After the steel has been obtained in the necessary thickness, it is drawn through draw-benches so that the sections are produced in the required shape. The draw bench, in reality, forms the sheet metal in the desired shape.

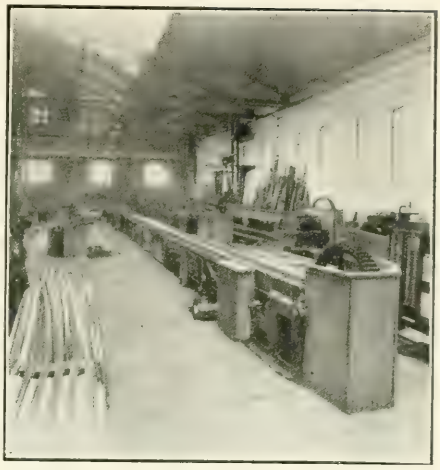


Fig. 2. Draw-Bench Used for Drawing the Steel Shapes.

The interest that the reader will have in these products is the possibility of employing them for uses heretofore untried. There are undoubtedly many kinds of ornamental goods that can be made by using them. This company manufactures many hundreds of shapes so that a manufacturer can undoubtedly pick out shapes that will meet his needs. It is be-

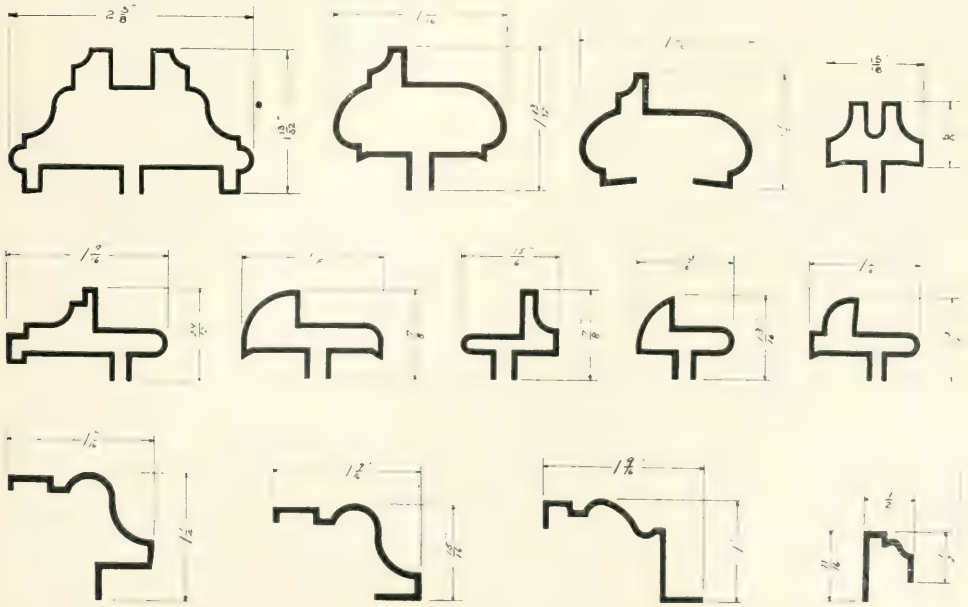


Fig. 1. Some of the Large Variety of Drawn Steel Shapes Made by the United States Metal Products Co.

lieved that manufacturers of ornamental goods of many varieties will find these shapes useful in making their goods. It will, perhaps, obviate the need for making special dies as the shapes can be obtained in long lengths which need only to be cut to the lengths required in the manufacture of the goods. The steel can be electroplated in any desired finish, while the bronze can be left in the natural color or finished as may be required.

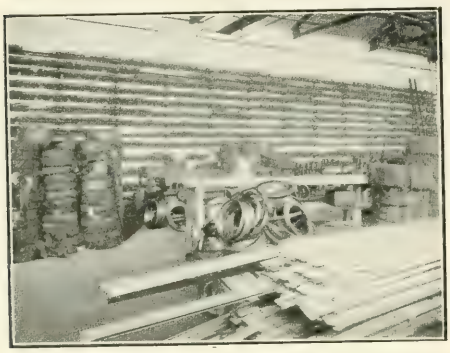


Fig. 3. Sheet Steel Used as the Raw Material.

These shapes are now being manufactured by the United States Metal Products Co., with offices at 203 West 40th. St., New York City and works at College Point, N. Y. and Brooklyn, N. Y. The company is the consolidation of the John W. Rapp Co., and the J. F. Blanchard Co. In Fig. 1 are shown a few of the shapes, in cross-section, that are made but many hundreds of others are also manufactured.

Varying the Quality of Electro Deposited Copper by Varying the Current and the Temperature.

In a paper read at the meeting of the *American Electrochemical Society,* held in Boston, Apr. 18-20, C. W. Bennett describes his observations on the tensile strength of copper deposited on a rotating cathode. The following are the results and conclusions of his experiments.

1. Copper has been deposited electrolytically at a current density of 4,000 amperes per square foot or about 430 amperes per square decimeter.

2. In the electrolytic precipitation of a metal the crystal size decreases as the cathode is rotated more rapidly, other things being equal.

3. The crystal size decreases as the current density increases, and increases as the temperature rises.

4. The concentration of the electrolyte can be varied quite a little without changing the character of the deposit.

5. If the precipitation is carried on at a high temperature an effect similar to annealing is accomplished during the electrolysis.

6. The tensile strength of metals varies inversely as the crystal size, and hence any factor tending to decrease the crystal size tends to increase the tensile strength.

7. The effect of rapidly rotating the cathode and of increasing the current density is to increase the tensile strength, the crystal size being decreased.

8. A good deposit of copper could apparently be obtained at an infinite current density if the stirring were efficient enough to prevent impoverishment.

9. The current efficiency at a high current density with rapid rate of rotation, is high, it being 99.6 per-cent.

10. "Hard drawn" copper can be deposited on a rotating cathode at almost any current density, if the temperature be kept down; and likewise annealed copper, if the temperature be kept at about 75°C.

11. Electrolytic copper has been obtained having a tensile strength of 68,000 pounds per square inch (47.6 kg. per sq. mm.).

12. A deposit as good as the best can be obtained with a current density of 2,400 amperes or more per square foot (264 A. per sq. dm.) with the rate of stirring used.

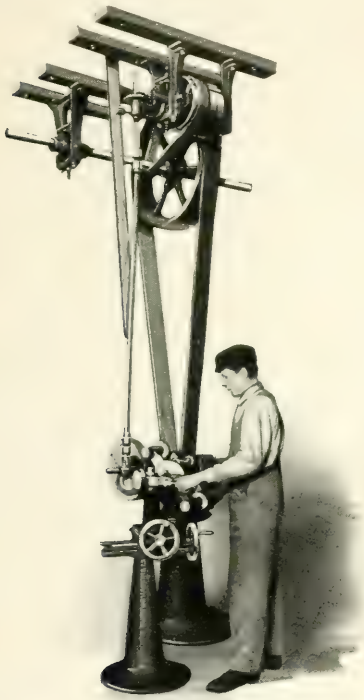
13. With the alloys, the trouble is most likely a question of colloidal material.

14. Acid solutions, with readily soluble salts, and no possibility for the formation of colloids should be sought for as electrolytes in alloy precipitation.

While zinc and spelter are synonomous terms and are used to designate the same metal, the term "spelter" is often employed to indicate the common grades of zinc, while zinc is frequently used to designate the refined metal.

The Automatic Buffing of Metal Goods.

Hand buffing is not only expensive, but unless the buffer is skilled, poor work is apt to result at times. The expense of such hand work, however, is the chief argument against the method and in view of this, the Automatic Buffing Machine Co., 56 Indiana St., Buffalo, N. Y. have placed on the market a



Method of Using the Automatic Buffing Machine.

machine for buffing metal goods that has proved to be very satisfactory and is already in use in a large number of establishments.

The machine is unique in that it does not require skilled labor and boys or other unskilled help may be used for operating it. The article to be buffed is simply placed on the chuck and fed to the machine. The machine does the rest.

Some of the goods that may be buffed on the machine are: Automobile lamp parts, bedstead trimmings, stove rings, screw-caps, reflectors, plumbers' goods, faucets, gas burners, cooking utensils, clock cases, and many other kinds of metal goods ordinarily buffed by hand. The machine has recently been greatly improved.

The Amount of Nickel in Single and Double Nickel Salts.

Two kinds of nickel salts are used in electroplating, viz:

1. Single nickel salts.
2. Double nickel salts.

The single nickel salts are known chemically as "Nickel Sulphate" and are made by dissolving oxide of nickel in sulphuric acid, or by dissolving metallic nickel in sulphuric acid, or by dissolving nickel in nitric acid and evaporating with sulphuric acid to drive off the nitric acid. Single nickel salts, therefore, consists of nickel and sulphuric acid.

Single nickel salts contain .... 20.88% Nickel

Double nickel salts are known chemically as "Nickel Ammonium Sulphate" and are made from ammonium sulphate and single nickel salts. By taking the right proportion of each, dissolving water and evaporating, large, green crystals of the double salts are obtained.

Double nickel salts contain ... 14.85% Nickel

The single and double nickel salts have a different appearance and may readily be distinguished. The single salts are in much smaller crystals than the double salts. The crystals of the double salts are larger and well defined.

Tungsten Carbide for Meter Jewels.

A novel use has been proposed for tungsten carbide which, it is claimed, is sufficiently hard for use as meter jewels. Not only can this substance be employed for such work, but the depression in the end can be made artificially in the furnace.

A bead of metallic tungsten, obtained by fusing the powdered metal in an electric furnace is used for the starting point. The bead or beads are then heated in a carbon tube furnace of the electric resistance type. The carbon vapors are absorbed by the tungsten and produce a very hard tungsten carbide. The carbon also lowers the melting point of the tungsten so it fuses, and when it cools, there is a depression or cup-shaped cavity in the top of the bead. This renders the subsequent drilling and polishing for use as a meter-jewel less difficult and laborious.

It is claimed that the hardness of the tungsten carbide thus produced is such that the material may be used in place of sapphires or other native jewels for the bearings of electric meters. The tungsten carbide is also non-corrosive.

Roseleur's Tinning Solution for Small Iron or Steel Goods.

It is frequently desired to tin small iron or steel goods such as nails, screws, pins and similar articles. In such cases a mere film of tin is all that is required and really amounts to a whitening. Roseleur's solution is excellent for this purpose and is used as a dip. No electric current is necessary. The following is the solution recommended by him:

Water	10 gallons
Ammonia Alum	1½ lbs.
Fused Chloride of Tin	1 oz.

The solution is used as hot as possible and the iron or steel goods, bright and free from rust are dipped into it. In from 30 to 60 seconds a bright coating of tin will be deposited on the surface. The solution can be replenished by the addition of fused chloride of tin when necessary.

The ammonia alum and not the potash alum should be used. Fused chloride of tin is used because, unlike the regular tin crystals, it contains no free acid.

A New Pyrophoric Alloy.

The usual pyrophoric or sparking alloy, used for self-igniting match-boxes and gas lighters, consists of an alloy of 70% cerium and 30% iron. A German inventor has found that alloys of manganese and antimony have the same property and are cheaper than the cerium alloys. For certain purposes about 10% of chromium may be introduced, and in making, it is advantageous to add a very small quantity of aluminum or magnesium during the melting to promote fluidity and soundness.

The mixture advocated is as follows:

Manganese	80%
Antimony	10%
Chromium	10%

The advantage of the alloy, in addition to cheapness, is that instead of giving a shower of sparks, like the cerium alloys, a long streak of flame is produced, thus obviating the need of the familiar friction wheel. The alloys are air proof and, it is stated are not subject to disintegration like the cerium alloys.

A New Etching Solution.

In etching copper and brass plates which have been coated with a fish-glue or an albumen resist, a standard solution of perchloride of iron is almost exclusively used for the reason that it is about the only material that will etch the metal without acting upon the resist. According to a German patent, the following solution is good, particularly for zinc and aluminum.

The following mixture of the dry ingredients is first made:

Aluminum fluosilicate	4 parts
Ammonium fluosilicate	12 parts
Ammonium bi-phosphate	30 parts
Ammonium nitrate	38 parts
Aluminum nitrate	14 parts

One gallon of water is used to dissolve 6 oz. of a mixture of the foregoing ingredients, and to it a pint of a thick, liquid gum-arabic solution is added.

It is claimed that this solution may be used with resists impossible with other etching liquids.

The Volatility of Zinc Oxide.

It is usually supposed that oxide of zinc is not volatile, even at very high temperatures, and that unless there is metallic zinc formed there is no volatilization. In brass making it is supposed that the metallic zinc is what volatilizes and oxidizing in the air, forms the familiar oxide of zinc fumes.

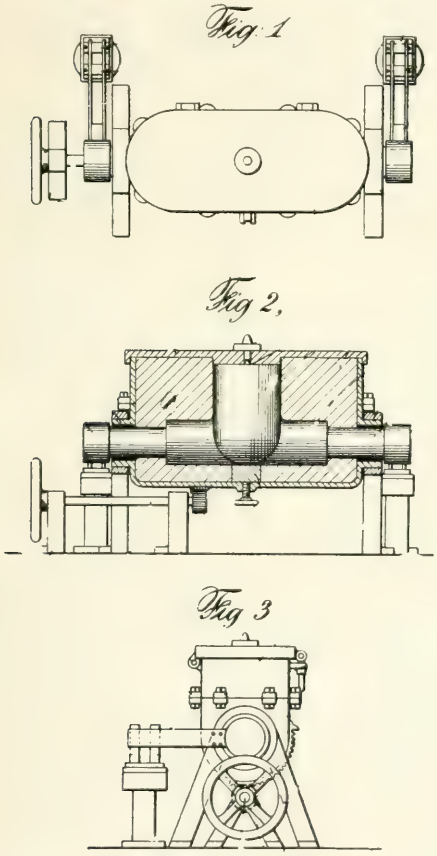
In a paper read at the meeting of the *American Electrochemical Society* in Boston, Apr. 18-20, O. L. Kawalke gives some experiments which he made to ascertain whether oxide of zinc is actually volatile and it was found it is volatile at comparatively low temperatures.

He found that oxide of zinc can be completely volatilized at temperatures from 1370° C. to 1400° C. When the temperature rises above these amounts, the volatilization be-

comes more rapid. It was found that at a temperature of 1400°C. the volatilization of the oxide of zinc, after a period of 10 minutes heating, was 13 per-cent.

A Tilting Electric Furnace.

A tilting electric furnace has been patented by Michael R. Conley of New York and is herewith illustrated. The furnace is of the resistance type and a difficulty experienced



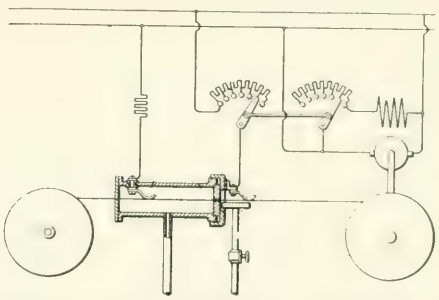
Tilting Electric Furnace.

with resistance furnaces has been overcome. This difficulty is that, when the metal is melted, the voltage quickly drops and the quantity of current passing is greatly increased. To obviate this trouble, the furnace is provided with a melting pot with an inner wall of non-conducting material. This is a non-conductor until highly heated, when it becomes a conductor. Fire-clay has this property and is used. When highly heated, therefore, this lining will take the current, but its resistance is so high that an excessive amount of current does not pass through it. There is a balance set up which tends to prevent the rapid drop in the voltage.

Carbon electrodes are used and the furnace is mounted on trunnions and tipped by means of a hand wheel as shown in the illustrations.

Drawing Wire While Red Hot.

In the manufacture of tungsten lamp filaments, the wire of which they are made, must be drawn red hot as it does not have sufficient ductility when cold. A German inventor has devised the following apparatus for drawing the wire while hot.



Method of Drawing Tungsten Wire While Red Hot.

The wire is heated by an electric current passing through it, and the resistance offered producing the heat. The wire is enclosed in a chamber and the atmosphere in it made reducing or neutral. The contacts are readily made and by regulating the quantity of current passing, the heat may be adjusted.

This process is interesting for the reason that it shows the possibility of not only drawing wire while hot, but also of the possibility of annealing wire during the actual drawing operation.

Gold that has become dull and tarnished, may be cleaned, according to a German chemical journal, by means of the following solution: Dissolve in 1 gallon of water, 4 oz. of bleaching powder, 4 oz. of bicarbonate of soda, and 1 oz. of common salt. The article to be cleaned is allowed to remain in it for some time. After which it is taken out, rinsed and dried in sawdust. If warmed, the operation is more rapid, and for obstinate cases of dirt should be used in this manner.

Questions and Answers.

QUESTION No. 1137. We wish to color our yellow brass castings red on the surface, just as many manufacturers of plumbers' brass goods are doing. What is the method of doing it?

Answer. Yellow brass castings may be turned red on the surface by an acid pickle. Use the following:

Water	4 gallons
Sulphuric Acid	1 gallon

Place the water in a stone crock and then add the sulphuric acid to it. Stir with a wooden stick while adding the acid. Do not add it all at once, but gradually with stirring. The mixture will become hot. Place the castings in this pickle and they will gradually turn red. It may take several hours, but if the pickle is kept hot, the red color is obtained in a short time. In other words, it works much more rapidly if heated. Do not leave the castings in the pickle after the right color has been obtained, or they will become dead. The acid dissolves the zinc from the surface, leaving the copper.

QUESTION No. 1138. I am having some trouble in successfully plating die castings which have been cast of a metal composed of a zinc base, with some tin, aluminum and copper in it. My trouble comes from the fact that I do not seem to be able to clean the castings properly. Then, too, it is more or less a porous metal, and when the plated castings come to the buffing room, the deposit shows considerable blistering.

Answer. Any metal mixture containing so much zinc as that contained in die-castings is very apt to oxidize on standing. Possibly this is your difficulty. If badly corroded from standing in moist atmosphere, it will be necessary to scour the surface with fine pumice and water. If not badly corroded, then a muriatic dip, after cleaning the castings from grease, will usually take off the film of oxide on the surface. Use a dip composed of equal parts of water and muriatic acid and immerse the castings in it for a few seconds or until clean. Usually a momentary dip suffices. The blisters you mention are not caused by the porous metal, but either by the use of too much free cyanide in the solution or the employment of too strong a current. These, coupled with the imperfect cleaning produce blistering in both copper and brass plating solutions, which are, we presume the ones you are using for plating the die castings.

QUESTION No. 1139. How can I obtain a brown finish in yellow brass, both sheet or articles made from it and castings? The majority of the work is push-plates and similar electrical work.

Answer. Yellow-brass can be colored a brown shade by means of the following dip:

Water	1 gallon
Caustic Potash	8 oz.
Liver of Sulphur	2 oz.

Use the solution as hot as possible and immerse the brass in it. When the right shade, take out, rinse and scratch brush dry. The coloring may take from 5 to 10 minutes. The brass should be clean and with a buffed surface if the browned brass is also to be polished.

QUESTION. No. 1141. How can iron screws be plated with a black finish that will keep them from rusting? The screws have to match a japanned stove body and we have tried black-nickel and copper oxidizing without satisfactory results. The screws must be done cheaply and we will have several hundred thousand. The cost of finishing must not be over 6 cents per hundred.

Answer. You will be obliged to japan the screws in order to obtain a finish that will match the japanned parts of the stove and is cheap. You could japan the screws in a tumbling barrel if the threads did not fill up. You will, perhaps, find the best method to dip the heads in japan, leaving the rest of the screw bare. A cheap, baking japan can be used for this purpose.

QUESTION No. 1142. Will pure manganese alloy with bronze by adding it to the melted metal? I want to add 0.5% of manganese to a brass composed of 60% copper and 40% spelter. If I add the manganese after the spelter has been added, will this answer?

Answer. You will not be able to introduce the manganese in this manner. Its melting point is so high (practically that of steel) that it will not melt and mix with the brass. You should first make an alloy of copper and manganese and add this to the brass. Melt together the copper and manganese in the proportions of 80 lbs. of copper and 20 lbs. of manganese. To introduce the 0.50 of manganese, use 2½ lbs. of the alloy of copper and manganese, to 100 lbs. of brass, making allowances for the copper added. You can purchase the alloy of manganese and copper already made into ingots.

QUESTION No. 1143. In the bench molding of brass castings there is always scale mixed with the sand after the flask has been dumped. Can you tell us of a better way of breaking this scale than by hand-sieving the sand? This information would no doubt be of benefit to many brass molders.

Answer. The scale you mention is the sand that is in contact with the molten metal and which has been burned by it. The heat bakes it to a hard mass. When the castings have been dumped, this hard sand scales off and becomes mixed with the rest of the sand. Hand riddling is always used for breaking up the scale and mixing it with other sand. We do not know of any other method being used. We presume rolls could be used, or even a power sand-sifter, but in brass molding the amount of sand used is usually so small that large, power driven appliances have not met

with much favor. In iron molding, where very large quantities of sand are employed, such machines frequently can be advantageously employed.

QUESTION No. 1144. In a newspaper clipping, it is stated that silver deposit ware can be made by depositing the silver on the glass like a mirror and then building up in a silver plating bath in the usual manner. This does away with the usual process of "firing" the article in a kiln after the silver paint has been put on. Is this method satisfactory and is it used at all?

Answer. The method you mention was the first tried when silver deposit ware was put on the market. It was at once found wanting as the silver does not adhere. The only satisfactory method for making the ware that has been found is to paint the silver, previously finely powdered, mixed with a flux, on the surface of the glass, and then heat in a kiln until the flux melts and adheres to the glass. The silver is then deposited in the regular manner on the fused design on the glass. In this manner the silver adheres tenaciously to the glass.

QUESTION No. 1145. We have been attempting to smelt tin-dross in a furnace heated by natural gas in which a temperature of 2800° can be obtained. We mixed the dross with coal dust and soda-ash and heated for four or five hours. We expected to obtain a yield of 80% tin, but none was produced. Instead, the results were as follows:

Tin-Dross Charged ..... 675 lbs.
Material obtained:

Heavy Slag	360 lbs.
Light Slag	110 lbs.
Loss	205 lbs.

The light slag contained a trace of metal. The heavy slag contained about 95% tin. What is wrong in the treatment of this dross?

Answer. You undoubtedly used an oxidizing flame in your furnace which, instead of reducing the tin from its oxide, actually oxidized it so that what metal there was in the dross (tin dross is never all oxide but contains considerable metal) was oxidized and went into the slag. We do not know of anyone using natural gas for smelting tin dross and the furnaces in operation are run with soft coal. By means of this fuel it is possible to obtain a reducing flame which reduces the tin from its oxide. We believe that this is your difficulty.

QUESTION No. 1146. What is a good formula for electrogalvanizing malleable iron?

Answer. The formula in general use for electrogalvanizing both malleable and gray iron, as well as sheet or wire, is as follows:

Water	1 gallon
Zinc Sulphate	2 lbs.
Aluminum Sulphate	4 ozs.

This solution is used cold and the current employed should have about 6 volts tension.

QUESTION No. 1147. Do you know whether a cast aluminum automobile lamp reflector has been used in place of sheet metal?

Answer. We have never heard of a cast aluminum reflector being used on automobile lamps. We presume it could be used if a sound casting were obtained, but cast aluminum is so apt to come with pin-holes in it that more or less difficulty would be encountered in producing a satisfactory casting. Sheet aluminum would be preferable on this account. In case you desire to use an aluminum casting, or try it for use as a lamp reflector, we suggest the use of the following aluminum mixture:

Aluminum	82 lbs.
Zinc	15 lbs.
Copper	3 lbs.

This mixture gives a sounder casting than the regular aluminum and copper mixture and is not so apt to contain pin-holes.

QUESTION No. 1148. We are desirous of buffing silver plated hollow-ware, which we are about to make, instead of burnishing it. We want to do it as we buff nickel. We understand that this is done to a very great extent on chafing dishes, coffee-percolators, etc. At the present time we are following the method of putting a good coat of silver on the goods, scratch-brushing the work after it comes from the plating tank, and then, in the buffing room, cutting it down with fine Vienna-lime composition, after which it is colored up in the same manner as nickel. In this coloring-up, we have used nothing but the Vienna-lime, but we have not been able to obtain good results. We are desirous of finding out whether the fault is in the method of buffing, or in the buffer. We have examined goods made in other shops and they lead us to believe that buffing was used instead of burnishing in finishing them.

Answer. Very little burnishing is now done on hollow-ware that has been silver plated. It is too expensive. Now and then small articles, such as a napkin-ring, which can be revolved on a lathe, are burnished, but it is done because cheaper. Practically all hollow-ware is buffed. Your difficulty lies in the use of Vienna-lime. It is too hard for silver. You should use a soft rouge made especially for silver work. There are also some good soft white buffing compositions for silver and which are soft.

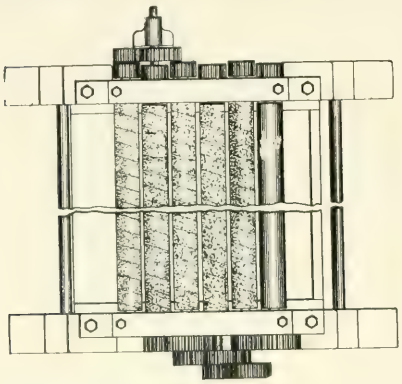
QUESTION No. 1152. In copper plating steel work to be oxidized is it necessary to use any different formula than for ordinary copper plating?

Answer. The same formula of cyanide copper is used. It must, however, be sufficiently heavy for standing the liver of sulphur solution. A copper deposit that will answer for some purposes and is quite light, may not do for oxidizing as the liver of sulphur attacks it. A fairly heavy copper deposit is always preferable. If you find, that after oxidizing, and relieving, that the wheel cuts through to the steel, then it is safe to assume that the copper deposit is not sufficiently heavy.

Patent Abstracts.

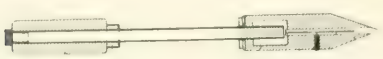
1,021,478, Mar. 26, 1912. ELECTRIC INDUCTION FURNACE. James Henry Reid of Newark, N. J. Assignor to George Goodwin of Ottawa, Canada. An electric induction furnace, the heat for which is obtained through the medium of heating coils. A number of furnaces are heated by a single coil by moving it successively to them. The furnace is to be used for smelting or melting.

1,021,302, Mar. 26, 1912. DETINNING MACHINE. William M. Connor of Baltimore, Md. The machine is novel in that it removes the tin from the tin plate by a scraping process and is not dependent upon any



chemical processes like other detinning methods. The tin plate scrap is fed to the machine and the tin is removed from the surface by metal scrapers and brushes as it passes through rolls. A flat kind of tin-plate scrap must be operated upon in order to have the tin scraped off.

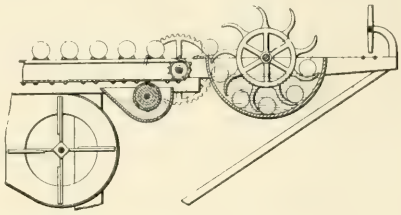
1,020,971, Mar. 26, 1912. SOLDERING IRON. Nathan I. Dryfoos of Cleveland, Ohio. The feature of the soldering iron lies in the



fact that solder can be inserted inside and the flow can readily be controlled.

1,022,599, Apr. 9, 1912. PROCESS FOR PRODUCING THE ALLOY OF TITANIUM WITH COPPER. Auguste J. Rossi of Niagara Falls, N. Y. Assignor to the Titanium Alloy Co. of the same place. The titanium is reduced by carbon from its oxide by the electric furnace and in presence of metallic copper.

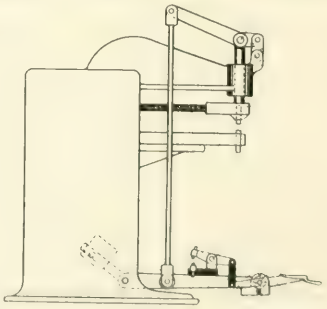
1,021,074, Mar. 26, 1912. MACHINE FOR LACQUERING CANS. Arthur Y. Seely of Blaine, Washington. The process or machine is applied to the lacquering of food cans. The cans are conveyed to the lacquer tank by an



endless belt and are dipped and taken out by it. The feature of the invention lies in the manner of making this belt or conveyor.

1,022,128, Apr. 2, 1912. BUFFING MACHINE. Edwin Rust Douglass of Glenside, Pa. A buffing machine designed for the polishing or buffing of metal caps. The cap is first automatically presented to a coarse or cutting down wheel, after which it is fed to the buffing wheel for the final finishing. While intended more especially for hollow caps, the machine can be used for buffing any small, sheet metal articles that can be gripped by the revolving chuck jaws.

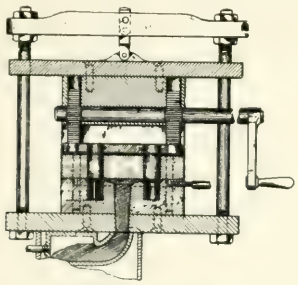
1,021,732, Mar. 26, 1912. ELECTRIC WELDING MACHINE. Albertis C. Taylor, Assignor to the National Electric Welder Co. of Warren, Ohio. A machine for use on "spot-welding", although it may be employed for butt or lap welding. The machine is an improvement upon previous spot-welding



machines in that it obviates the heating of the metal about the spot before the electrodes are brought in contact. The electrodes are also brought in contact and the current started by a single operation. The possibility of spoiling work is also obviated to a large degree.

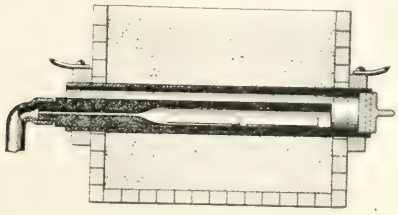
1,022,182, Apr. 2, 1912. METHOD OF WIRE DRAWING. The process is applied to the manufacture of tungsten wire, employed as electric light filaments. This wire is drawn while red hot through diamond dies and difficulty has heretofore been experienced in obtaining a suitable lubricant. The claim is made for "aquadag" or artificial graphite suspended in water. In certain instances, a 10% solution of ammonium sulphide is used in connection with it as it is claimed that it imparts excellent drawing qualities to the wire.

1,023,884, Apr. 23, 1912. CASTING APPARATUS. Orrin M. Sherman of Syracuse, N. Y. Assignor to E. B. Van Wagnar Mfg. Co., of the same city. The apparatus is for producing "die castings" by means of pressure and forcing the metal into the mold. The improvement lies in the manner of forming the sprue. Heretofore it has been customary



to cut off the sprue while the metal was in the mold and while hot. In cooling, this leaves a cavity in the metal. The present machine casts the gates on the metal casting in the same manner as followed with a sand mold, and afterwards cut off.

1,023,371, Apr. 16, 1912. ELECTRIC FURNACE. Carl T. Fuller of East Orange, N. J. Assignor to the General Electric Co. An electric furnace for use in the production of tungsten electric lamp filaments. It is so con-

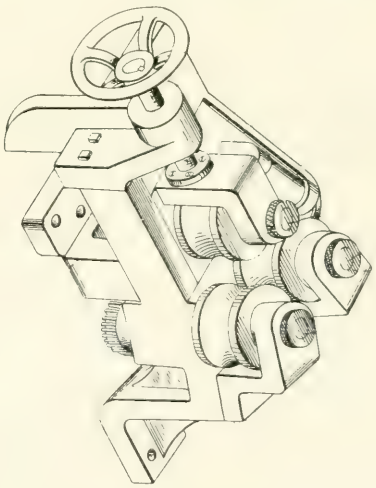


structed that hydrogen gas may be passed in while the heating is going on. The furnace is so made that there is no danger from contamination from carbon while the heating is taking place.

1,023,208, Apr. 16, 1912. PROCESS FOR THE PRODUCTION OF PYROPHOROUS SUBSTANCES FOR IGNITION AND ILLUMINATION. August Lesmüller of Munich, Germany. The process is upon the production of a cerium and silicon alloy for pyrophoric or sparking purposes. The combination of these two elements is said to produce a superior sparking metal.

1,022,487, and 1,022, 561, Apr. 9, 1912. ELECTROPLATING APPARATUS. Geo. A. Lutz of Plainfield, N. J. Assignor to the American Circular Loom Co. The apparatus is designed for electrogalvanizing iron pipes. The feature lies in the method of holding the pipes while in the plating tank. The pipes may be plated both inside and outside and the method of carrying this out is one of the features of the patent.

1,021,449, Mar. 26, 1912. PIPE OR TUBE BENDING MACHINE. James Fillmore Cox of Bayonne, N. J. A machine for bending pipe or tubing without filling it. This is ac-



complished by the use of several grooved rollers as illustrated and which are so placed as to avoid flattening the tube while it is being bent.

1,023,799, Apr. 23, 1912. MACHINE FOR BUNDLING SCRAP. Charles W. Bennett of Pittsburgh, Pa., Assignor to the American Sheet & Tin Plate Co. A machine for bundling or cabbaging sheet metal scrap and is applied more particularly to the treatment of tin-plate scrap. The machine is so designed that the scrap may be readily bundled and the bundles tied by the machine.

Trade Items.

The McRae Mfg. Co., has been organized in Detroit, Mich., to take over the business formerly conducted by McRae & Roberts, manufacturers of plumbers' goods.

The Elyria Brass, Iron and Steel Co., of Elyria, Ohio, has gone into the hands of a receiver. This company recently built a plant, but had not placed it in operation. J. C. Hill is the receiver.

Within a short time, the Light Manufacturing Co., of Pottstown, Pa., manufacturers of aluminum castings, will move to their new plant now occupied by the Chadwick Engineering Co. When this company vacates, the Light Mfg. Co., will take possession. Much greater facilities will then be had for manufacturing.

The advantage of a sprinkler system in factories was recently demonstrated in the plant of the Champion Stove Co., of Cleveland, Ohio. The night watchman heard water running from a sprinkler head which had opened. It was found that a fire had started in a can of sweepings, but the water had automatically quenched it before it was noticed.

The Inland Steel Co., Indiana Harbor, Ind., have recently placed on the market a new kind of steel in which copper is used as an alloying metal. It is claimed that with the copper in the steel, it becomes much more non-corrosive and more readily worked. This steel is called "Vismera" by the them and is claimed to be 99.932% pure. The amount of copper in it, although but 0.2%, is claimed to do the work.

A non-poisonous lead-pipe has recently made its appearance in England, being manufactured by E. Walker & Co., of Heckmondwike, Yorkshire. This special form of pipe is composed of an outside of lead with an inside of seamless copper tubing which is in turn lined with block-tin. The copper and lead are joined so thoroughly that the pipe may be bent or treated like ordinary lead pipe without rupture. The lead pipe is intended for use for conveying water which acts upon lead and contaminates it, and which also cannot be carried by iron pipes.

The Basic Mineral Co. of Pittsburgh, N. S., Pa., manufacturers of "Radioclarite" and the "Miller Bronze Alloy Flux" for use in melting brass, bronze and scrap metals, have found that, owing to shipping facilities, a plant further west is necessary. They will, therefore, in the near future, erect a plant in Springfield, Ohio from which the western trade will be looked after. The plant in Springfield will be located on the New York Central lines where the best of facilities will be had. The office and warehouse in Pittsburgh is to be still maintained and business will be looked after from this point. In addition to fluxes for the non-ferrous metals, iron and steel fluxes are manufactured.

The main office of the American Tube Works has been moved from 95 Broad St., Boston, Mass., to 10 Oliver St. Brass and copper tubes are manufactured. The plant is at Somerville, Mass.

The Norton Company of Worcester, Mass., manufacturers of abrasives and abrasive wheels, are to erect a new building that is to be devoted to a research laboratory. This new building is to consist of three stories and a basement.

Landers, Frary & Clark, New Britain, Conn., the extensive manufacturers of cutlery and household hardware, are about to commence the manufacture of a line of nickel plated bath-room fixtures. This line is to be exceptionally complete and new designs will be made.

The general offices of the Celluloid Zapon Co., manufacturers of lacquers and enamels, have been moved from the Metropolitan Life Insurance Building, No. 1 Madison Ave., New York City, to No. 200 Fifth Ave. The works of the company are located in Stamford, Conn., but all business is transacted from the New York office.

Henry M. Lane, who, in connection with R. I. Clegg, has been editor of *Castings* from its inception, has resigned his position and will, hereafter, devote his time to consulting engineering and metallurgical lines. Mr. Lane has had extensive experience in foundry practice and is an authority on the subject. Mr. Lane will open offices for his engineering work within a short time. His present address is 301 Caxton Bldg., Cleveland, Ohio.

Elbert Hubbard, the well known writer, has compiled a pamphlet entitled "Joseph Dixon, One of the World-Makers" and in which the history of Joseph Dixon, the founder of the Joseph Dixon Crucible Co. has been written. In this, the author has followed a custom he has established of compiling articles on noted persons. This pamphlet contains twenty-four pages, and is published by the Roycrofters, East Aurora, N. Y. Copies may also be obtained from the Joseph Dixon Crucible Co., Jersey City, N. Y.

The date for the 1912 Convention of the American Brass Founders' Association, the American Foundrymens' Association, and the Foundry and Machine Exhibition has now been definitely set for the week of Sept. 23rd. The Convention will, as previously mentioned, be held in Buffalo and will start on Monday, continuing throughout the week. Some very interesting papers are promised and it is expected that the Convention will surpass any yet held. It should be noted that while previous Conventions have been held in May or June, this one is to be held in the early Fall. It is believed that this change may result in a much larger attendance.

The Electrical Specialty Co. has been incorporated at Bartlesville, Oklahoma with a capital stock of $50,000. The manufacture of switchboards and electrical apparatus will be carried on.

A. J. Corcoran, Inc., 11 John street, New York City, with factory at Jersey Ave. and 13th. St., Jersey City, N. J., makes a specialty of building tanks for holding acids, plating solutions and other liquids. These tanks are so made that they require no lining and are guaranteed water-tight.

The plating department of the Spirella Company, formerly of Meadville, Pa., has now moved to the new plant at Niagara Falls, N. Y. This company are extensive manufacturers of corsets, stays and hose supporters and manufacture a complete line of metal corset trimmings and metal accessories.

The Damascus Bronze Co., Pittsburgh, Pa., manufacturers of bearing and bearing metals, have just issued a new catalogue of twenty three pages and compiled in an excellent manner. This catalogue is well illustrated and in it the products of the company are described. A specialty of heavy bearings and bearing metal ingots is made by the company.

The Electrical Alloy Co., Morristown, N. J., are now manufacturing wire and ribbon of a new resistance material which they call "Calido". This metal has a melting point above 2800°F. and has a high resistance equal to that of mercury. It is used for electrical heating work, and for spark points. This company also make special nickel wires for spark points on electrical apparatus.

The business conducted by Paul S. Reeves & Son, 1415 Catherine St., Philadelphia, Pa., brass and bronze founders and metal smelters, has been incorporated with a capital stock of $160,000, under the name of Paul S. Reeves & Co. The former firm went into the hands of a receiver some time ago and the new company has been formed to continue the business. The officers of the new company are: President, Randolph Mac Farland; treasurer, Leo Mac Farland; secretary, E. J. Decker. The sales manager is Samuel K. Reeves. The manufacture of the same line of work as before will be carried on.

Manufacturers who desire to reduce the cost of buffing, should investigate the automatic buffing machine, made by the Automatic Buffing Machine Co., 56 Indiana St., Buffalo, N. Y. This machine is now in successful operation in a large number of establishments manufacturing automobile lamps, horns, stove trimmings, cooking utensils, etc., and with it, unskilled labor may be used. It should be investigated by all who have buffing to do, and while not suitable for every kind of article, there is such a large variety that can be done on it, that one cannot afford to refrain from investigating it. Full information and catalogue will be sent upon request.

Gaynor & Mitchell Mfg. Co., of Bridgeport, Conn., manufacturers of brass goods and brass novelties, are to erect a new plant in Stratford, Conn., a suburb of Bridgeport.

The name of the Champion Safety Lock Company of Geneva, Ohio, manufacturers of locks and hardware, has been changed to the Champion Hardware Company.

The Maxeff Electric Horn Co., has been incorporated in Detroit, Mich., with a capital stock of $15,000 to manufacture automobile horns. This horn is something new in the line of automobile devices and has been patented.

The largest crane in the world has recently been finished by Cowans, Sheldon & Co., Ltd., of Carlisle, England for the Japanese Navy Department and which will be erected at Kure, Japan. It is designed to lift 200 tons at 105 feet radius.

The new addition that is being built to the plant of Haines, Jones & Cadbury of Philadelphia, Pa., manufacturers of plumbers' brass goods, will contain the brass foundry, pattern shops and metal storage department. The brass foundry will be on the third floor. The addition is in the form of a two and three story building, and is 60 x 108 feet.

The Hanson & Van Winkle Co., of Newark, N. J., the well known manufacturers of plater's supplies and equipment, have recently brought out a new platers' scrubbing brush which they call the "Elk". This is a high grade brush and is intended for the severest use. For large, heavy work it will be found particularly suitable. It is composed of black tampico and is 5 knots wide and 10 knots long.

George H. Chandler, formerly of New York City and export representative of the Levett Mfg. Co., and the Munning-Loeb Co., has now become associated with the New York Buff Company, 85 Center Street, New York City. Extensive repairs and alterations have recently been made by this company at their factory, and they are now in a position to take care of their customers better than ever before. The promptest shipments can now be made on account of their increased facilities.

The Michigan Smelting & Refining Co., of Detroit, Mich., are one of the largest manufacturers of brass and composition ingot in the United States. Their ingot is made in a manner that insures uniformity and they are, therefore, always able to guarantee it. The method they pursue in making the ingot is such that the exact chemical analysis of every ingot is known and they are, therefore, able to insure their customer that he will obtain exactly the mixture he desires. In addition, this company make all kinds of babbitt-metals and solders. The new plant of the company is a most complete one and contains the most modern appliances for carrying on the manufacture of ingot metals.

The Waterbury Buckle Co., of Waterbury, Conn., the largest manufacturers of buckles and similar goods in the United States, are to erect a new factory 58x123 feet.

The National Aluminum & Bronze Mfg. Co., has been incorporated in Indianapolis, Ind., with a capital stock of $10,000 to conduct a brass, bronze and aluminum foundry and a machine shop.

The Eagle Stamping Company, 357 Seventh Ave., Buffalo, N. Y., manufacturers of metal stampings, specialties, etc., have taken over the business of the Reliable Metal Stamping Co., of that city. The latter concern has manufactured the same line of work.

The Jeffrey Dewitt Company, Detroit, Mich., manufacturers of automobile sparkplugs, are to erect a new addition to their works this spring. This addition is to be 40 x 100 feet. In this plant the production of the porcelain for spark plugs will be carried on.

According to statistics compiled by Henry R. Merton & Co., the well known metal dealers, the production of copper in the world for 1811 was 873,460 tons of 2240 lbs. This is the largest quantity of copper yet produced in a year and exceeds that of 1910 by about 17,000 tons.

The Electrical Alloy Co., of Morristown, N. J., manufacturers of wire, are now making a specialty of fine wire for the manufacture of scratch-brushes for platers and silversmiths use. The wire is made of any diamater and of any kind of metal. Steel, bronze, brass, German-silver or special alloys will be supplied whenever desired.

Attention is called to the new compound metals recently placed on the market by the Hoyt Metal Co., of 111 Broadway, New York City and St. Louis, Mo. These are made with an aluminum core and britannia-metal, tin, or lead covering. In this manner a very light and cheaper metal is obtained and which can be used for the majority of purposes where the solid material is now employed. These compound metals can be spun, drawn or stamped like the regular metals.

The dynamos for plating and electrogalvanizing made by the Eager Electric Co., of Watertown, N. Y., are now used in a large number of establishments all over the United States and Canada and are giving the best of satisfaction. These dynamos are manufactured particularly for the plating trade and will develop the full rated capacity continuously. The Eager Electric Company desire prospective customers to compare the commutator and brush capacity with that of other machines. In addition to plating dynamos this company make motors and dynamos for lighting. Motor driven buffing lathes and emery grinders are likewise a specialty with them. Catalogues will gladly be sent upon request.

The Allen-Bradley Co., 495 Clinton St., Milwaukee, Wis., have purchased the rheostat department of the American Electric Fuse Co., of Muskegon, Mich. The manufacture of the rheostats and controlling apparatus will be continued by the former company.

The Warner Instrument Co., of Beloit, Wis., manufacturers of automobile speedometers and brass founders, are to build an addition to their plant. This addition is to be 96 x 120 feet and the capacity of the plant will then be increased fifty per cent. Work on the plant will be started at once.

The Universal Spring & Hinge Mfg. Co., Mansfield, Ohio, has been organized in that city with a capital stock of $15,000 for the manufacture of hinges. A factory is to be established for manufacturing. Calvin Keith and John M. Edmonson are interested in the company.

The brass foundry of the Canton Brass & Machine Co., of Canton, Ohio, which was destroyed by fire some time ago, has been rebuilt and is already in operation. Modern foundry equipment has been installed. A plating department is operated in connection with the business. Brass specialties are manufactured.

The Dixie Scale Co. of Fayetteville, N. C., manufacturer of scales, are to install a brass foundry and a nickel plating plant at their new works. The brass foundry is to have a capacity of 300 lbs. per day. A new factory is to be buillt at Charlotte, N. C. and the brass foundry and plating plant will be installed at this location. This company will manufacture a new kind of scale. W. D. Rush is the president of the company.

George S. Shea, 333 Munson St., New Haven, Conn., is now doing glass silvering for the trade. He is making a specialty of silvering the interior of glass knobs used on furniture and as a part of builders' hardware. Mr. Shea is an expert in this line and now numbers among his customers some of the largest hardware makers. Glass knobs are now coming into extensive use and the interior must be silvered in order to cover up the connection made at the back. Mr. Shea would be pleased to correspond with those desiring this work.

The American Smelting & Refining Co., of Cincinnati, Ohio, are headquarters for ingot metals of all descriptions. Ingot copper, aluminum, zinc, lead, tin and spelter are supplied in large and small lots. In addition, a very complete line of babbitt-metals, solders, type-metals and other white metals are made. Brass and composition ingots are a specialty with the company and are made to conform to specification. This company are also the sole manufacturers of "Kansas Select Double Refined Spelter" which proved to be so satisfactory for brass foundry use. Users of any of these metals should obtain quotations from the company before purchasing elsewhere.

E. F. Lake, consulting metallurgist and formerly associate editor of the *American Machinist,* has been placed in charge of the laboratory of the Perfection Spring Co. of Cleveland, Ohio.

The Standard Metal Mfg. Co., of Newark, N. J., manufacturers of sheet brass and other metal goods, are to add to their plant an addition 45 x 110 feet and three stories high This will be located on Chestnut and Malvern Sts. The cost of this improvement is $20,000.

The Lumen Bearing Co., Buffalo, N. Y., and Toronto, Canada, have just issued a very extensive catalogue in which a large number of views of their plant are shown. These illustrations are of large size and indicate the progress of a casting from the begining with the raw metal up to the final finishing.

Owing to the recent death of Francis Hendricks, the firm of Hendricks Bros., 49 Cliff St., New York City has been dissolved and incorporated under the same name. Harmon W. Hendricks has been elected president and E. J. Geane, secretary and treasurer. Hendericks Bros. were one of the oldest dealers in metals in the United States and also conducted a copper rolling mill at Belleville, N. J.

The Barlow Mfg. Co., of Holyoke, Mass., manufacturers of window display fixtures and similar goods, have commenced the manufacture of a water heater for household use. This heater is quite unique and to market it a new company called the Matchless Heater Co., has been formed. The Barlow Mfg. Co., will continue to manufacture the heaters. The heater differs from others on the market in that it lights by electricity and requires no pilot light with its danger and expense. The heater uses gas as the fuel.

The Thomas Buchanan Company, 216-218 Elm St., Cincinnati, Ohio, are now manufacturing and selling a new material for case-hardening steel which has many valuable qualities. In the first place there are no poisonous fumes given off such as those evolved from cyanide. In addition, the material is handled in the same manner as cyanide, but works deeper, better and cleaner. This material is called "Case-Hardo" and is manufactured under a patent process by the company. Those who do case hardening should write for information.

The Roessler & Hasslacher Chemical Co., 100 William St., New York City, have recently issued a new booklet entitled " Electroplating with Trisalyt" and which contains much useful information. They state that the formulas have all been tried and proven and all platers should have a copy. The "Trisalytes" as well known, are the new plating salts that can be used either for making up a new plating solution, or regenerating an old one. This booklet will gladly be sent to those who ask for it, and all platers should avail themselves of this opportunity.

The plant of the American Brass Works at Spokane, Wash., has been purchased by the American Mfg. Co. and will be conducted for the manufacture of irrigation pumps.

The Hendee Mfg. Co. of Springfield, Mass., manufacturers of the "Indian" motorcycle, are to erect an addition to their works. This new addition is to be 40 x 88 feet.

A. Klipstein & Co., the well known chemical manufacturers and importers of chemicals, have moved to their new building at 644-654 Greenwich St., corner of Barrow St. Greatly increased facilities are now had.

The Niagara Brass Mfg. Co. of Buffalo, N. Y., has obtained the three-story brick factory at 163 Adams St., in that city and to which its plant is to be moved. The present location of the plant is at 59, The Terrace. The manuafcture of stamped brass goods and brass screws is carried on.

The Steel Button Manufacturing Co., manufacturers of metal buttons, buckles and similar goods, has moved to its new plant at 473 Ketty Ave., Paterson, N. J. Increased facilities have been obtained by the acquisition of this new plant. The sales office is at 130 Bleecker St., New York City.

The business conducted by Baker & Shevlin of Saratoga Springs, N. Y., has been absorbed by a new company incorporated for the purpose and called the George F. Shevlin Mfg. Co. The capital stock is $600,000. The manufacture of paper machinery is carried on and brass goods are also made.

The Columbia Metal Stamping Co., which has been conducted as a partnership in Cleveland, Ohio, has now been incorporated with a capital stock of $25,000. A new plant was recently built at 1538 East 49th. St. The new officers of the company are: President, Fred. C. Koch; secretary and treasurer, James C. Ertel. Fred C. Koch is the general manager. Metal stamping is carried on.

The Morgan Construction Co., of Worcester, Mass., manufacturers of rolling mill machinery, have issued a new catalogue of some of the machines which they manufacture. It is devoted to "Wire-Mill Equipment" and contains thirty-two pages, well illustrated. This catalogue contains a description of furnaces, wire-blocks, and all other machinery used in the drawing of wire. Much interesting information in regard to wire drawing is contained in it.

C. W. Leavitt & Co. desire to announce to the trade that "Leavitt's" Magnesium Metal is meeting with excellent success throughout the metal trades. It has a silver-white color and its specific-gravity is 1.75. It is, therefore, much lighter than aluminum. It offers the best means for producing castings of the lightest weight. As a means for eliminating oxides from molten metals, it has now become extensively used and in casting nickel, aluminum, copper, zinc, lead and tin it has been demonstrated to be excellent.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.19
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia, 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.08
Arsenic, Metallic	lb.	.10
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.50
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitrol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.10
Chrome-Green	lb.	.50
Copper, Lake (carload)	lb.	.16
Copper, Lake, (cask)	lb.	.16¼
Copper, Electrolytic, (carload)	lb.	.15⅞
Copper, Electrolytic, (cask)	lb.	.16⅛
Copper, Casting, (carload)	lb.	.15¾
Copper, Casting, (cask)	lb.	.16
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Flour Spar	lb.	.01¼
Fusel Oil	gal.	3.50
Gold Chloride	oz.	11.75
Gold, Pure	oz.	20.87
Gum Copal	lb.	.30
Gum Guaiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iridium	oz.	63.00
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04¼
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	1.16
Mercury, Metallic (Quicksilver)	lb.	.41
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.40
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Saltpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Cloride	oz.	23.00
Platinum Metallic	oz.	46.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.08
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.60⅛
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin Metallic	lb.	.45¾
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc, Carbonate, dry	lb.	.19
Zinc, Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.06⅞

THE BRASS WORLD AND PLATERS' GUIDE

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Contents for June.

Alloys, Non-Corrosive and Cheap White 204
Annealing Without Oxidation, Vaughan Hughes Method of 209
Anode, The "Economy" Form of 215
Anti-Friction Metal, A Lead and Copper 208
Brass Foundry Mixtures, Standard 204
Brass and Bronze Plating Solutions, and How to Make Them 206
Brass Rods, Electric Welding of 197
Bronzes, Ancient 200
Clocks as a Scrap Material, Old 193
Copper Solution, Making an Acid 198
Copper Deposits, Cause of Rough Acid 217
Cutlery, Use of Cobalt-Chromium Alloy for 203
Electrogalvanizing, Cleaning Anodes in 196
Extrusion Chips as New Scrap Material 218
Flat-Ware Advertisement, An Early 219
Films, Production of Soft Metal 214
Lead, New Process for Refining Scrap 195
Manganese in Alloys, Errors in Use of 191
Manganese-Bronze Castings, Cause of Leakage ... 216
National Electroplaters' Association 218
Nickel Anode, New Form of 215
Nickel and Iron, Electrodeposition of 213
Nickel Deposits, Removing Old 212
Nickel Deposits, Improving 199
Nickel Solutions, Determination of Boracic Acid in 195
Scrap Metal Trade, Importance of 199
Sodium Cyanide, Increasing Use of 192
Spoons, French Method of Making 208
Phosphor-Bronze Mixtures, Standard 204
Wood, Electroplating of 201
Zincs, Method for Amalgamating Battery 196

Errors in the Use of Pure Manganese in Alloys.

The use of metallic manganese as a deoxidizing material in metal and alloys has now become quite extensive. It has been found particularly efficacious in the nickel alloys, such as German-silver or cupro-nickel

While the best method of using the manganese in such alloys is to introduce it as manganese-copper, for the reason that not only can this material be purchased of high purity, but it also renders the introduction of the manganese positive, many persons prefer to purchase the pure manganese and use it in the nickel alloys. Unless this pure manganese is added in the right manner, the results are uncertain, and it has been found that makers of nickel alloys have been obtaining results lacking in uniformity simply because the manganese was not introduced into the molten metal in the right manner. It has been added directly to the metal after the latter has melted. This is wrong as will afterwards be explained.

Pure manganese melts at about the same temperature as steel, which it will be appreciated, is very much higher than that of the German-silver or other nickel alloys. On this account, when it is added to the molten metal, it does not melt, but remains on the melted mass in its original condition. When the crucible is skimmed, therefore, the manganese is removed with the skimmings. In regard to this difficulty, there are some persons who believe that the manganese, although it has a much higher melting point than that of the German silver or other nickel

alloy to which it is added, will gradually dissolve and so enter the alloy. While this is undoubtedly true, provided the manganese is left in the molten metal sufficiently long, the period which elapses, after the manganese has been introduced, is so short that very little dissolves. Even though it may, the results are not positive and the quantity of manganese that enters the metal or alloy is variable and uncertain.

The best method of adding manganese to copper or copper alloys, is first to make a rich copper and manganese alloy, and then use this for adding to the German-silver or other copper alloy to be treated. This procedure enables the manganese to be introduced with certainty for the reason that the copper and manganese alloy melts at about the temperature of the German-silver or other alloy. It then diffuses itself through the metal shortly after it melts.

The common method and one which gives satisfactory results is first to make a copper and manganese alloy containing 70% copper and 30% manganese. The manganese and copper are melted together in a crucible at a heat sufficiently high to melt the manganese, after which the mass is stirred and poured out into small bars so that they can readily be cut into small pieces.

This copper and manganese alloy (called manganese copper or often cupro-manganese) is added to the metal or alloy in the proportion of about 5 oz. to 100 lbs. of the molten metal. While it can be introduced after the metal has melted, far better results are obtained if it is added when the metal is put into the crucible and it is allowed to melt with the other metals. This gives the manganese a far better opportunity to act. The manganese then begins to do its work as soon as it melts.

The Increasing Use of Sodium Cyanide.

In THE BRASS WORLD, April and October 1906, the use of sodium cyanide in electroplating was exploited for the first time. It had previously been used in the mining industry, but its use in the plating trade had not taken place up to this time. Realizing its advantages, we made trials of it and became so firmly convinced that it could be used to a great advantage in electroplating to replace potassium cyanide or the double potassium and sodium cyanides, that we deemed it advantageous to bring the matter to the attention of the trade in the two articles previously mentioned.

Since that time, platers have given the cyanide a trial with the result that it is now extensively used in the plating trade for all classes of work. At first, it was employed only in the solutions for copper plating as in many of the lines doing this class of work the highest grade deposit was not required. It was, therefore, tried on this unimportant branch of plating, so to speak, as platers, as a rule were suspicious of it and feared that it might not give the results that were obtained by the other cyanides. Proving satisfactory in copper plating and finding no difference in the results, they then turned their attention to brass plating and tried the sodium cyanide in it with equally as good results as those produced in copper plating. No difference in the results could be detected.

At first, silver platers did not take kindly to the sodium cyanide. Silver plating is such a delicate operation and so much depends upon the silver deposit, that chances could not be taken and it was some time, after sodium cyanide made its appearance on the market that it was tried in the silver plating trade. Gradually, however, it became used until now the silver trade is using it regularly and some of the most conservative manufacturers have adopted it exclusively. The results obtained by it have been found identical with those produced by the potassium cyanide or the double potassium and sodium cyanides.

The advantage of sodium cyanide lies in the fact that it is cheaper than the potassium cyanide. Sodium compounds are always cheaper. It is cheaper from the fact that it has greater dissolving power and it takes less to dissolve a given weight of copper carbonate or silver chloride. In addition to this, it has another advantage, not generally appreciated, in that it does not "spot out" when used in making a copper or brass soluton for plating cast or malleable iron. The reason is that sodium compounds give off their water upon exposure to the air, while potassium compounds do not. When the plating solution oozes from the pores of the casting, it dries, becomes a powder and may be brushed off. Potassium compounds absorb water from the air, liquefy and spread over the surface producing the well known spots.

Old Clocks as a Scrap Material; Their Use and Method of Assaying for Value.

The manufacture of clocks consumes the largest amount of sheet brass of any single use. It even surpasses that consumed in the manufacture of cartridge shells which is frequently considered as the largest use although it is actually surpassed by the clock industry. The consumption of clocks is also rapidly increasing and there is a far greater number made to-day than five years ago. Cheap clocks comprise the greatest proportion and these are usually made in the cheapest possible manner on account of the competition that exists in the clock trade, and the fact that the public demands a clock that can be sold at a very low figure. The cheapest form is the well known alarm-clock with the round, nickel plated case. These are sold at retail at a ridculously low figure and are consumed in large quantities. They are sold so cheap that when they need repairing, which they usually do in a short time, it is much cheaper to purchase a new one and throw the old one away than to spend more than the cost of the clock in having it repaired by a repair man. It is for this reason that a large quantity of clocks, such as those shown in the accompanying illustration contain such a large number of these small, round clocks. Larger clocks, known as "8 day movements", are much better made and last longer. As they cost much more it is usually considered economical to have them repaired when they get out of order.

The fact that such large quantities of the nickel plated alarm clocks are consumed, and they get out of order so rapidly is responsible for such large quantities finding their way into the scrap metal trade. Such old clocks, whether they are simply the movements or whole, are classed as "light brass" and are known by this general term in the scrap metal trade. Light brass is a term used to designate any form of light, yellow brass. Red metal does not come under this head. Light brass may consist of old clocks, lamp burners, bird-cages, lamps, gas-fixtures, electric lamp sockets and many other kinds of light yellow brass goods. There is no difference in them, they are all classed the same.

An Assortment of Old Clocks as Sold to Copper Smelters.

Along with other scrap material, old clocks are gathered by the junk pedlar who, in turn, after he has accumulated a sufficient quantity to warrant it, sells them to a scrap metal

dealer who gathers enough to sort them and remove the clocks from the other material. When of sufficient quantity, he sells them to copper smelters or others who can use them. Copper smelters, however, are about the only ones who can use the clocks.

Light brass of all kinds, including old clocks, have two outlets:

1. As a raw material for copper smelting.
2. As a source of brass for the making of yellow brass ingot.

Old clocks, of course, are not all brass but contain a large amount of steel in the form of springs, screws and studs. An ordinary brass clock movement will not contain over half its weight in yellow brass. The rest is steel. On this account, there is but one outlet for the clocks and that is in the smelting of copper. Owing to the amount of steel in the clocks, they cannot be used very successfully for the manufacture of brass ingot, although it has been done. The ingot resulting from them is quite inferior and contains a large amount of iron. It is impossible to skim it all off and some of the small screws or other parts remain in the ingot, and at the same time, some of the iron combines with the brass forming "combined iron" hardening it considerably. There is, therefore, but one true outlet for the old clocks and that is in the smelting of copper. Even the copper smelters do not like them on account of the large amount of iron they contain. They cannot smelt them alone, but must use only a small quantity, otherwise the blast furnace would be clogged by a "salamander." By using them in small quantities, however, it is possible to smelt them successfully.

Scrap metal dealers accumulate a varied assortment of light brass material from junk men and sort it into two grades: First, the best grade of light brass that can be used for making a second grade yellow brass ingot. Second, old clocks to be sold as copper bearing material to copper smelters. A lot of clocks, such as those shown in the illustration accompanying this article, are kept by themselves and sold without mixing with any other material. In order to sell them to a copper smelter it is necessary to make an assay to value them. From the standpoint of ordinary analytical chemistry this would be an unsatisfactory process, but if attacked in the right manner it is not so bad after all. Very close results can be obtained. To take a small quantity for the assay would be out of the question and the best and most accurate method of assaying has been found as follows:

Take about a half-bushel of the clocks representing a fair sample of the lot, and by the use of a vise, hammer, cold-chisel and pincers, separate the brass from the steel. This is not a difficult job and the brass and steel can be readily separated. Weigh the clocks before starting. After the brass and steel springs, etc., have been separated, the brass is melted down in a graphite crucible under a layer of borax for a flux. When melted, pour out into an ingot and weigh. If a smaller quantity than half-bushel will represent a fair sample, then it can be taken, but care should be used not to take too small an amount. Frequently a peck or so will answer if the clocks are all about the same kind.

The brass ingot obtained by melting the brass obtained in the separation of the brass and steel in the clocks, is weighed. If it is impossible to separate all the steel from the brass completely, then the crucible containing the molten brass should be skimmed to remove as much of it as possible. The weight of the brass ingot should be carefully taken.

Drillings from the brass ingot are now made and these are then used for the determination of the copper by the electrolytic method. The percentage of the copper in the lot of clocks first used can then be calculated from this copper determination. As an example of the process, the following can be cited. It represents an actual assay of a lot of clocks sent to a copper refiner:

Clocks Used	7950 grams
Brass Ingot Obtained ..	3925 grams
Copper in Ingot	66.20 %
Copper in Clocks	32.68 %

The method of calculating the percentage of copper in the clocks from the determintion of the copper in the ingot is as follows: The ingot of brass weighed 3925 grams and 66.20% of it is 2598.35 grams which is the total amount of copper contained in the ingot. This amount, 2598,35 divided by 7950 gives the percentage of copper in the clocks (after multiplying by 100, of course). The result obtained by the division is 32.68, which is the percentage of copper in the lot of clocks sold to the copper smelter

Clock brass, used in the form of sheet for making the brass portions of clocks consists of the following:

Copper	5 parts
Zinc	3 parts
Lead	1¾ lbs. to 100 lbs. of the copper and zinc.

This calculated in percentage is as follows:

Copper	62.50%
Zinc	35.75%
Lead	1.75%

Clock brass does not contain as much lead as generally supposed and in this respect is not as high lead material as screw rod. It has been found too difficult to roll the brass when it contains more than about 1¾% of lead so that the cost of rolling more than offsets the cheapening produced by the slight extra quantity of lead.

A New Process for Refining Scrap Lead.

A new process for refining scrap lead of all kinds has been patented by Julius Asbeck of Krantscheid-Westerwald, Germany. The process is applicable to the refining of the various kinds of scrap lead found in commerce, but is particularly applicable to the treatment of old lead storage-battery plates.

The process consists in the use of caustic-soda and sulphur as a flux and which are applied to the lead when melted. The mixture employed as this flux consists of the following:

Caustic soda	3 parts
Sulphur	1 part

In place of this mixture, equal parts of caustic soda and sodium hyposulphite, or 3 parts of caustic soda and 1 part of liver of sulphur may be employed. The mixture of caustic soda and sulphur, however, is good and should be mixed before adding to the molten lead.

The amount of this flux in refining the lead is about 2 lbs. to 100 lbs. of the lead. The lead is heated to about 400°-500° C. (752 - 932°F) and the flux added and the whole stirred. The flux is allowed to act for a short time and then skimmed off. If necessary, the operation may be repeated.

The inventor states that 5,000 lbs. of old lead which contained the following:

Copper	0.084%
Nickel	0.0076%
Silver	0.0080%

were treated with 100 lbs. of the flux and in three treatments the resulting refined metal contained:

Copper	0.0072%
Nickel	0.0080%
Silver	0.0081%

It will be appreciated, therefore, that the copper is removed to a large extent, while the nickel and silver are not. The advantage of the flux, however, lies particularly in the removal of the zinc, antimony, arsenic and tin.

The inventor states that the theory of the action of the flux lies in the formation, at the beginning, of lead sulphide which is then reduced by the caustic soda forming sulphite or sulphate of soda. The foreign metals, such as the copper, arsenic or tin are either sulphurized or oxidized and enter the slag or dross. Pure lead, comparatively speaking, is thus obtained.

Determination of Boracic Acid in Nickel Plating Solutions.

Boracic acid is now extensively used in nickel plating solutions and it may often be necessary to determine it. According to A. Wogrinz and J. Kittel in the *Chemiker Zeitung*, page 433, 1912, it may be estimated in the following manner. They say:

"Gravimetric methods for the determination of the boracic acid, in nickel plating solutions containing, as they always do, ammonium salts and citric acid, fail owing to the loss of the acid during or after evaporation with sodium carbonate or magnesium chloride. The volumetric method, involving the use of glycerine or mannitol is unreliable in the presence of ammonium sulphate, and if glycerine is used it is found that it causes high results owing to its own acidity, when employed in the quantity necessary for a sharp end reaction. The presence of sodium sulphate, though not without effect, is not

*Citric acid is not used in nickel plating solutions to any extent in the United States, although it would appear from this article that it is employed in Germany. *Editor.*

very inconvenient, and it is therefore possible to obtain fairly reliable results as follows:

The sample of nickel plating solution is electrolyzed by depositing the nickel on a platinum cylinder and with a platinum anode and its object is to remove the nickel and destroy the citric acid*. The ammonium salts are then decomposed by evaporation with solid sodium hydroxide. The residue is then dissolved in water and made neutral to methyl orange, a sufficient excess of mannitol is added and the titration completed with phenolphthalein as an indicator. For a quantity of liquid, in which the boracic acid is equivalent to 30-50 c. c. of N/5 alkali, about 100 c. c. of a 10 per-cent mannitol solution are used."

Importance of Cleaning Anodes in Electrogalvanizing.

In electrogalvanizing, the zinc anodes become coated with a black scale, after they have been run for some time, and unless this is cleaned off, the solution becomes unbalanced and the electrodeposition of the zinc is rendered imperfect.

This black scale which forms on the anodes is caused by the lead in the zinc. All zinc, even the purest grade that can be obtained on the market, contains lead as an impurity, and it is the principal impurity, too, that is found in the metal. Much time and thought has been given the subject of purifying zinc and eliminating the lead, but so far it has not been accomplished in a manner that leaves nothing to be desired. A highly refined zinc, to be sure, contains only a few hundredths of a per-cent of lead, but its cost is such as to prohibit its use as an anode material in electogalvanizing. For this reason, the commercial grades of zinc are employed.

The commercial grades of zinc, employed for making anodes in electrogalvanizing, contain from 0.50% to 1.50% of lead. Under the action of the current, the zinc gradually dissolves in the electrogalvanizing solution, leaving the lead on the surface. As time goes on the lead increases on the surface until a comparatively thick scale is formed. This lead scale, being insoluble in sulphuric acid, does not dissolve but really forms a coating over the entire zinc surface, effectually preventing the zinc from going into solution. The lead, of course, being metallic does not act as an insulator, but allows the current to pass; but at the same time, no zinc comes off the anodes and they do not feed the solution. As a matter of fact, the plating operation becomes similar to that which would take place were an insoluble anode like carbon used. The zinc is gradually exhausted from the solution and it becomes more and more acid until the deposit of the zinc is imperfect and finally does not take place at all.

The remedy, of course, is to clean the anodes as frequently as necessary, removing the lead scale with a stiff brush and exposing clean zinc to the action of the current. From indications, it is believed that this neglect to clean the anodes when necessary, is frequently the means of unbalancing the electrogalvanizing solution and causing it to become too acid.

A New Method of Amalgamating Battery Zincs.

Large quantities of zinc are used in making batteries. In order to obtain a uniform and regular action, it is necessary to amalgamate the zinc with mercury. The old method of doing this was to coat the surface of the zinc over with mercury, but of late it has been customary to add metallic mercury directly to the molten zinc. About 3% of mercury is used.

John Beattie of Leete Island, Conn., has patented a method of amalgamating zinc for use in batteries which differs from the customary process. Instead of adding the mercury directly to the melted zinc, he first makes an alloy of mercury and sodium and then adds this to the melted zinc. About 96% mercury and 4% sodium are used and this small amount of sodium is capable of hardening the mercury so that the mass is solid and may be broken up. This alloy is added to the molten zinc.

The advantage of the mercury and sodium alloy over mercury is, the inventor states, on account of the small loss which occurs through volatilization. With the mercury, although 3% may be employed as the addition, considerable volatilizes and escapes. With the mercury and sodium alloy, this is reduced to a considerable extent. From 2% to 3% of the mercury and sodium amalgam or alloy are added to the zinc and owing to the less loss, a greater quantity remains in the zinc when cast.

The Electric Welding of Brass Wire and Rods.

For many purposes, the electric welding machine has proved much superior to the oxy-acetylene blowpipe, as it is easier to handle and gives more rapid results. For small work it is usually preferable.

A manufacturer of brass goods recently installed an electric welding machine and was surprised at the excellent results that could be obtained. It has been found possible to weld brass rods and wire into shapes heretofore extremely difficult to make, and to do them cheaply.

In electric welding, the rods are held in a clamp and the electric current passed through. The heat generated by the resistance offered to the passage of the current, actually melts the brass and causes the ends to unite. Electric welding, therefore, is, in reality, a melting together. As the melting is done in the open air, there is apt to be some oxidation, and it has been found if a gas flame is allowed to play upon the joint while the welding is taking place, this oxidation is partially overcome. The gas flame should be smoky in order to supply a reducing atmosphere and when this is the case, it acts as a reducing agent and prevents the formation of oxide, or

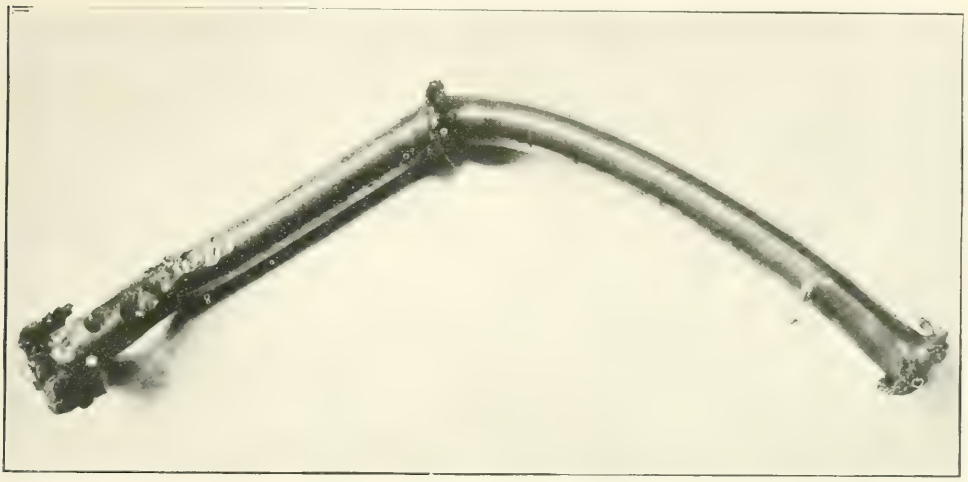


Fig. 1. Brass Rod, Electrically Welded, and Broken to Indicate the Strength at the Joint.

The two illustrations herewith shown are of electric welded brass rods about 1/8 in. in diameter. The rod shown in Fig. 1 was broken purposely to test the strength of the weld. It was found that the brass broke away

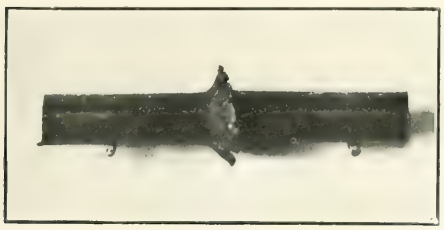


Fig. 2. The Brass Rod After Welding, Showing Fin Raised at the Joint.

from the weld in each case so that there is no question about the quality of the joint. In Fig. 2 is shown the appearance of the joint after the weld has been made.

reduces the slight amount which may be formed.

The electric welding of brass, therefore, is a matter that should be investigated by manufacturers of brass goods. It is an agent that will prove of great assistance and will not only reduce costs, but will enable one to accomplish things not heretofore possible.

The cracking of sterling-silver during rolling is caused, in almost all instances, by the presence of oxide of copper in it. If metallic cadmium is introduced into the sterling silver when the metal is being melted, the oxide of copper is removed and malleable castings are obtained. Oxide of copper in the sterling-silver is indicated during the rolling, more particularly during the "breaking-down" by the cracking at the edges.

The Acid Copper Solution and Method of Making It.

The acid copper solution (frequently called the duplex copper solution) is the oldest form of copper plating solution known. The early copper plating was invariably done by it. It is extensively employed in electrotyping and is the only solution that can be used for depositing copper of the necessary thickness.

Both the cyanide copper solution and the acid copper solution have advantages of their own and as a usual rule, one cannot be used to replace the other. In other words, each has its own particular field. The advantage of each copper solution is as follows:

The cyanide copper solution is used for plating iron and steel. An acid copper solution cannot be used for this purpose. Cyanide copper solutions have the property of removing a slight film of oxide from brass or other copper alloys, and for this reason, the utmost care is not as essential as it is when an acid copper solution is employed. They also have the property of removing a slight film of grease from all metals, owing to the alkaline nature of the solution and the fact that, during the plating, gas is given off which produces an electric cleaning action.

The disadvantages of the cyanide copper solution are that it takes a very long time to produce a heavy deposit, it is apt to blister unless care is used, and the solution is more expensive. It adheres to any metal tenaciously, however, and "throws" into deep portions of an article where an acid copper deposit would never reach.

The acid copper deposit never blisters and a copper deposit of any desired thickness may be obtained by it. It deposits copper rapidly. The copper is tough and uniform. It may be said, however, that the real reason for using an acid solution is the fact that it gives a heavy deposit.

The disadvantages of an acid copper solution are the fact that it cannot be used in plating iron or steel direct (unless a preliminary deposit of copper from a cyanide copper solution has been given it) on account of the fact that these metals precipitate the copper on the surface by immersion. The fact that the copper does not adhere as tenaciously as a cyanide copper deposit, particularly if there is a slight film of oxide or grease likewise militates against its use. In addition, an acid copper solution does not "throw" its metal well. Deep pockets or cavities frequently refuse to cover and the only way that the copper can be made to throw into them is to hang an anode in the interior. This is often impracticable.

The acid copper solution, however, is very useful for certain purposes. It gives a dead, satiny surface that has been found useful as the base for gilding in the production of ormolu-gold, and for giving any article a very heavy copper deposit it is absolutely necessary to use it.

Formula for Acid Copper Solution

The following method is used for making up an acid copper solution:

Water	1 gallon
Sulphate of Copper	1¾ lb.
Sulphuric Acid	4 oz. (fluid)

The solution made according to these proportions has a deep, blue color and should be clear. The 1¾ lbs. of sulphate of copper dissolved in the water will give a solution which stands about 16½° Beaumé. After the sulphuric acid has ben added, the solution will stand about 20° Beaumé.

The solution is used cold and with plenty of copper anodes. Copper is deposited very rapidly from an acid copper solution, and for this reason, the copper is removed from the solution with equal rapidity. Unless there is plenty of anode surface, therefore, the copper is deposited more rapidly than taken from the anodes. In fact, this is a very common occurrence and the principal difficulty in running an acid copper solution is its becoming too acid. When this is the case, the copper deposit is coarse and crystalline and it is apt to "burn" at the edges of the article. It is imperative, therefore, if an acid copper solution is to be used continuously, that there be no lack of anode surface; but if for any reason the solution should become too acid, then carbonate of copper can be used to neutralize the excess of free sulphuric acid and form sulphate of copper again.

The current strength in an acid copper solution is important and unless carefully regulated, good results cannot be obtained. From 1 to 2 volts should be used and if allowed to go much higher, the deposit is not as good.

An excessive current strength is manifested by the "burning" of the copper deposit at the edges. This "burning" is indicated by the formation of a dark colored deposit, and always appears at the edges first. After this, streaks appear. With a low current density, the copper deposit will be bright and uniform and with a fine, matt surface. If the current is stronger than necessary, then the deposit will become rough and dark, particularly at the edges, and streaks will make their appearance. Too much acid also causes the same thing.

The agitation of an acid copper solution is very advantageous. Copper deposits so rapidly from it that there is always an excess of acid around the cathode. This soon causes irregular working and the deposit then suffers. Agitation is far more necessary than in any other plating solution and in fact, unless it is carried out it is very difficult to obtain uniform or satisfactory results when a solution is worked regularly. There are several ways of agitating the solution. The simplest is to run a lead pipe down into the solution and blow air through it by means of a pump. Paddle wheels, pumps and similar forms of agitating apparatus can be employed and are used in the trade. It will be found that when the solution is agitated, as it always should be whenever it is possible to do it, that the copper can be deposited much more rapidly than otherwise and a higher current density can, therefore, be employed. Agitation, therefore, will be found economical.

A Method for Improving Nickel Deposits.

A patent has recently been issued to August Leuchter of New York City (U. S. Patent, 1,026,628, May 14, 1912) for an improvement in nickel plating. He claims that by incorporating a small amount of manganese with the nickel anode and also adding a manganese salt to the nickel solution, the nickel deposit is more lustrous, harder and more durable, and also more non-corrosive.

The anode is preferably made of 98% nickel and 2% manganese and the solution used is the ordinary nickel ammonium sulphate (double nickel salts) but manganese sulphate is added to it. The proportion is about 75% of the double salts and 25% of the manganese sulphate. The electrodeposition is carried out in the usual manner, employing this solution and the nickel and manganese alloy for an anode.

The proportions given, the inventor says, need not be exact. The anode may contain from 2% to 7% of manganese and from 93% to 97% of nickel. A small amount of tin is also advantageous in making the casting of the anode, the inventor states, but how much is not given. Tin, of course, in quantities of from 1% to 4% is used in the ordinary nickel anode in order to increase its fusibility in casting. The solution may contain from 15% to 25% of manganese.

It is also stated in the patent, that by incorporating a small amount of chromium with the nickel anode, a very much harder nickel deposit is obtained.

The Importance of the Scrap Metal Trade.

According to the *Daily Consular Report*, scrap metals of a non-ferrous nature, form a very important portion of the world's metal trade. It is reported in it that the value of scrap metals, such as those recovered from scrap brass, sweepings, skimmings, drosses and similar material was $52,585,390. This was for the United States. Though junk dealers pay low prices for small quantities of scrap metals, the competition for the scrap, drosses, skimmings and other waste products of large users of metals, is very active.

It is necessary for some uses to employ new metals, but as a general rule, scrap metals, in whole or in part, can be used by manufacturers. As they are sold at slightly lower price than new metals, they are in active demand and displace an equivalent quantity of new or virgin metals. The production of scrap metals in 1911 was Scrap copper, 50,845 tons worth $12,711,250; remelted brass, $16,814,400; lead, 54,254 tons, worth $4,882,860; spelter, 47,037 tons, worth $5,464,800; tin, 14,706 tons valued at $12,353,040; and antimony, $350,040.

To make chloride of zinc for a soldering flux, dissolve metallic zinc in muriatic acid until no more action takes place on it. Always have an excess of zinc so that there will be no free acid left in the chloride of zinc solution.

Ancient Bronzes.

The authorities of the Victoria and Albert Museum have issued a new edition of Mr. Stephen W. Bushell's monograph on Chinese Art, a book which is intended to be read in conjunction with visits to South Kensington and examination of the specimens which have been assembled there. The book opens with an introductory historical chapter in which the reader is carried through the age of stone and wooden architecture, subjects which lead one nearly half way through the volume, which is well illustrated. The fourth chapter opens with the consideration of bronze, about which it would appear that there is an extensive Chinese literature going back to considerably more than 1,000 years B. C. Practically the Chinese bronze founders confined themselves to copper and tin. According to a contemporary work written during the Chou dynasty, B. C. 1122-1249, and quoted by Mr. Bushell, six alloys were ordinarily employed, the following being their formulae and uses:—

1. Copper five parts, tin one part. Used in the manufacture of bells, cauldrons, and gongs, sacrificial vases and utensils, measures of capacity.

2. Copper four parts, tin one part. For axes and hatchets.

3. Copper three parts, tin one part. For halbert heads and trident spears.

4. Copper two parts, tin one part. For straight two-edged swords; which were made of two sizes, according to the height of the wearer; and for agricultural implements, such as spades and hoes.

5. Copper three parts, tin two parts. For arrow heads, employed in war and hunting, and for curved pointed knives, used for incising the script of the period on strips of bamboo.

6. Copper one part, tin one part. For mirrors, plane and concave.

It must not be inferred that pure metals were used, because investigations have shown that the tin and copper combined in ancient Chinese bronzes were rarely, if ever, in such condition, frequently containing appreciable proportions of lead and zinc. Both these metals influenced the color of the patina which is gradually developed by natural chemical processess on the surface of all bronzes that have lain long buried underground. The soil of China, charged as it often is with nitre and ammonium chloride, materially conduces to this kind of decomposition, and judges of Chinese antiques note carefully the crystalline coating of many colours veined with red, malachite green, and turquoise tints, as a valuable test of authenticity. The natural patina is occasionally counterfeited with artificial colours laid on with wax, but this deception gives up its secret when the surface is scraped with a knife, or by immersing the suspected piece in boiling water. Mr. Bushell discusses a considerable number of bronzes, notably sacrificial vessels, and wine vases, colanders, bowls, and bells. He explains that heavy bells were almost invariably cast where they were intended to remain, a method which obviated any difficulty in subsequent transit. Such bells were generally suspended on a beam supported by a framework of wood, after which the earth below was excavated to clear the rim. The bells were ordinarily struck from the outside with a swinging wooden bar, which had the effect of producing a deep booming sound which carried considerable distances.

Apart from bronze bells and cauldrons Mr. Bushell has written learnedly about the libation cups and wine jars, illustrating some of the latter, showing that the familiar English earthenware jug cow had its prototype in the far East in the shape of wine vessels moulded in the form of wild animals. Among the illustrations are also incense burners, mirrors, kettles, war drums, armillaries, vases, and perhaps quaintest of all, although comparatively modern, a Buddhist temple gong, somewhat after the shape of a body of a violin. Two examples of models, other than copper alloys, are described, to wit, an iron statuette coated with mosaics or realgar, and a curious and interesting rustic wine cup of silver which is dated 1361 A. D.—*The Ironmonger.*

Cadmium is a common impurity in spelter, but it has no appreciable effect on brass unless present in very much larger quantity than is ever found in commercial spelter. Even as high as half of one per-cent in the brass is not manifest, and when one per-cent is present, the brass is slightly harder, but not lacking in ductility and malleability. Cadmium cannot be called an injurious impurity in brass.

The Electroplating of Wood.

Wood is not a difficult material to electroplate and many unique effects may be made by plating it with various metals. The harder the wood, the more readily it can be prepared, although any kind of wood, hard or soft, may be plated without difficulty. The method is as follows:

Waterproofing the Wood.

The first operation in the electroplating of wood is to render it water proof. This is accomplished by first treating it with a good wood filler, rubbing off the surface and allowing to dry. The method is the same as though the wood were to be prepared for ornamental purposes in the interior of a house or for furniture.

When the wood filler has dried it may or may not be necessary to sand paper the surface with fine sand paper. If the surface has been well treated with the wood filler and the latter has been rubbed off before dry, then sand papering is usually unnecessary. The operator can easily ascertain whether it is necessary by the feeling of the surface.

Now give the surface a coat of a varnish known as "spar-composition." This is a varnish which dries tough and elastic and is quite suitable as a base for the electrodeposit. Varnishes which dry hard and brittle are not as good although, of course, they may be used. It has been found by experience, however, that "spar-composition" is preferable to other varnishes.

The "spar-composition" should be in a condition to spread evenly with a brush and not leave any brush marks when dry. In winter it may be necessary to warm it or thin with turpentine. In summer, it is usually of the right consistency.

This coating of "spar-composition" is allowed to dry, which should take over night and then a second coating is put on. This is put on in the same manner as the first *and should not be allowed to dry.* Allow the article, upon which the second coating of varnish has been put, to remain until the surface is "tacky." This may take several hours. In order to obtain the right condition, the varnish should have dried so that it is quite sticky.

Applying the Copper Powder

The next operation is to render the surface of the wood, now coated with varnish, a conductor of electricity. It is accomplished by means of the finest copper powder. This is metallic copper ground to an impalpable powder and is known in the trade as "copper-bronze powder." Ordinary bronze powder is not sufficiently fine and should not be employed.

The "copper-bronze powder" is brushed over the surface of the article coated with the varnish and which has become "tacky". The "tacky" nature of the varnish causes the copper powder to adhere. Brush it on good and

Wood Umbrella Handle, Copper Plated by the Method Described.

thick by means of a camel's hair brush *and leave on any surplus powder.* Do not brush it off, but pile on all the powder that can be put on, even though it may adhere but slightly. In beginning to put on the powder, brush it into the varnish well. The idea is to put on all the copper powder that can be used so that every portion of the surface will be covered. Later, the surplus will be removed, but do not take it off now.

The varnish, into which the copper powder has been brushed and piled on, so to speak, is allowed to dry hard. The length of time that was necessary for the first coating of varnish to dry should be noted, and the same

length of time should be given the second coat with the copper powder on it. Do not attempt to do anything until the varnish is dry or you will get into trouble. This may take from 24 hours to several days, depending upon the character of the varnish. There are quick drying "spar-compositions" which dry more rapidly than the ordinary kinds, and these can be used when time is an object.

When the varnish, into which the copper-powder has been brushed, has dried, the surplus powder is carefully brushed off. It will then be found that the surface is coated with copper completely. If not, the spots that are not covered, will have to be touched with varnish and allowed to become tacky. Copper powder is again brushed in and the whole allowed to dry.

Striking

The surface of the article is now coated with copper and is a conductor of electricity. Plating in an acid copper solution may now be carried on if desired, but it will be found that the copper deposit does not form evenly until after some time. If sufficient time is taken, however, very good results can be obtained, but it has been found preferable to "strike" the article coated with the copper powder, in a silver solution so that the surface will become coated with metallic silver. Any electriplating done on this takes place very evenly.

The "strike" is made as follows:

Water	1 gallon
Cyanide	3 oz.
Nitrate of Silver	3 oz.

In case the solution is not clear, add a little more cyanide, but to work well there can be little or no free cyanide present.

This "strike" is used without any current and the wood article, now coated with the copper powder, is immersed in it for a few seconds. The copper precipitates the silver from the solution and now, instead of being covered with copper, the surface is silvered.

The Electroplating

Although any electrodeposit may be put upon the wood by electrodeposition, a copper deposit from an acid copper solution should first be put on. This need not be heavy, and after it has been deposited, silver, gold, brass or any other metal may be deposited. After the wood article has been coated with silver in the "strike" it is ready for the electro deposition of the copper. An acid copper solution is used for this purpose and it is made as follows:

Sulphate of Copper	1¾ lbs.
Water	1 gallon
Sulphuric Acid	4 oz. (fluid)

This solution is used cold and the current should have a tension of from 1 to 2 volts. A high current density will cause the deposit to become rough and brittle.

The wood article should have some sort of a connection and this should always be put on before any of the operations have been put upon the wood. This can readily be done and the connection can be made upon some portion that is not important. A brass screw or nail driven into the wood is good. The connection is then made from this point. In electroplating, it must be realized that the wood will float in the solution, and on this account a weight should be hung from it at the connection in order to keep it down. A piece of brass or lead is advised and hung by an insulated wire so that copper will not deposit on it. Iron is not suitable as it decomposes the copper solution.

The copper is deposited in the usual manner, but if a heavy coating is desired, it is advisable to take the article out now and then and scratch-brush the surface in order to prevent roughness. If this is done it is possible to produce a heavy copper deposit that will be quite smooth. In the illustration is shown a wood umbrella handle that was copper plated by the method herein described.

The copper will adhere to the work tenaciously and there will be no evidence that it is not an integral part of the wood except in the matter of lightness.

If other metals, such as silver or gold, are to be deposited on the wood, then the article is given the copper coating in the acid copper solution in the usual manner, either light or heavy as may be desired, and then silver or gold plated in the regular manner.

Most of the early silver coins of the European countries contained considerable gold. This is true of the coinage previous to 1830 when the dry process of separating gold and silver was used. Later, when the wet process was employed, a more perfect separation took place and the silver coinage after this time has contained but minute amounts of gold

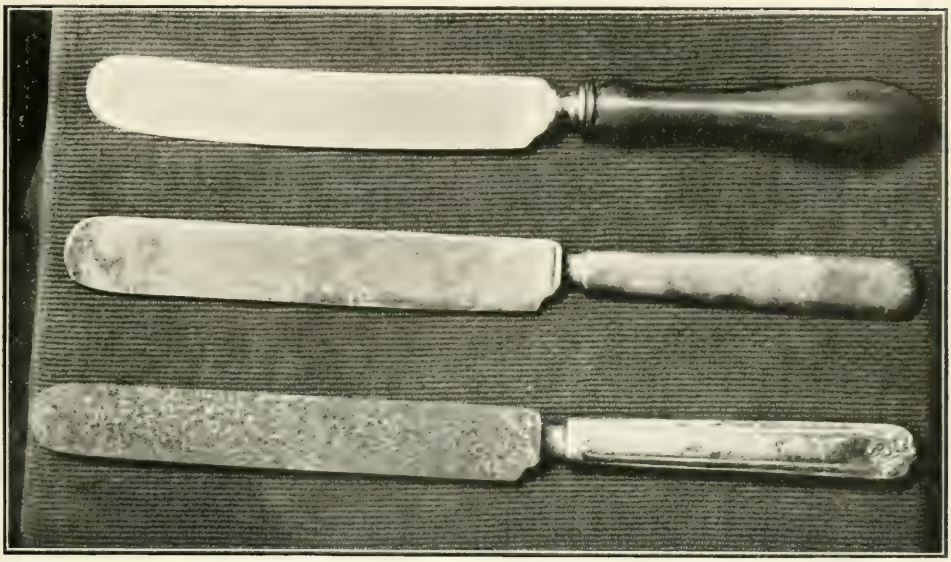


Fig. 1. A Steel Knife, a German-Silver Knife and a Cobalt-Chromium Knife. All Subjected to the Same Influences and Showing Relative Corrosion. The Bottom Knife is the Steel One. The Middle is the German-Silver and the Top is the Cobalt-Chromium Alloy.

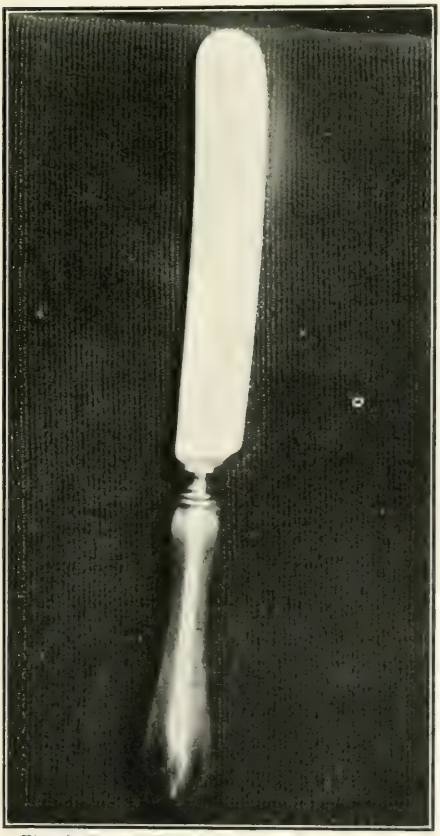


Fig. 2. Cobalt-Chromium Knife with Sterling Silver Handle.

The Use of Cobalt-Chromium Alloy for Table Cutlery.

In THE BRASS WORLD, Sept. 1910, page 321, was described a new alloy of cobalt and chromium which had been discovered by Elwood Haynes of Kokomo, Ind. This alloy was found by him to be so hard that it would take a cutting edge, and the same time is very non-corrosive and capable of resisting agents that rapidly attack other common metals. This alloy of cobalt and chromium is now being produced in a commercial manner by Mr. Haynes and a year or so ago he applied the name of "Stellite" to it, a term which is now used as the commercial designation. The alloy contains from 10 to 25 per-cent of chromium, depending upon the hardness desired. The more chromium it contains the harder it is.

Mr. Haynes early appreciated the value of the alloy in the use of cutlery and among the articles which he first made were pocket knives and table cutlery. He is now manufacturing these articles for the trade and those who use them will find that while they take an excellent cutting edge, they do not tarnish and corrosive liquids like fruit juices and other vegetable acids have no effect on them. Sulphurous compounds do not tarnish the metal in the least.

In Fig. 1 are shown three table knives. The first is an ordinary, high-grade steel knife with a silver handle. The second is a material called "Alaska-Metal" (German-silver). This is a solid knife. The third is a table knife of "Stellite" (the cobalt and chromium alloy) with a black nickel handle. These three knives were exposed for sometime to the same atmospheric influences and the result may be readily noticed. The steel knife is badly corroded. The Alaska metal is badly tarnished, while the Stellite knife is in the same condition, apparently, as it was originally.

In Fig. 2 is shown a table knife manufactured by Mr. Haynes which is regularly supplied with a sterling-silver handle. The blade is of Stellite and in addition to taking the edge of a steel knife, remains in a bright condition indefinitely.

Some New and Cheap Non-Corrosive White Metal Alloys.

According to English patents recently issued to J. F. Duke of Manchester, England, some very good and cheap alloys that are also non-corrosive may be made as follows:

Iron, copper, nickel and tin are melted in the following proportion:

Iron	30 parts
Nickel	20 parts
Copper	30 parts
Tin	2 parts

From 1 to 2½ per-cent of aluminum is added after the other metals have been melted in order to produce sound castings. The tin hardens the mixture and may be left out if a softer metal is desired.

It is stated that the alloy thus produced is not affected by the atmosphere and is suitable for builders' hardware, such as door-handles, knockers, etc., which are usually made of iron.

The following alloy, the inventor states, is suitable for a substitute for German-silver and consists of the following:

Iron	12 parts
Nickel	8 parts
Copper	4 parts
Aluminum	1 part

If desired to increase the hardness of the alloy, from 1 to 2 parts of tin may be added.

Standard Brass Foundry Mixtures and Method of Making Them.

By Erwin S. Sperry.

(*Continued from page 167, May, 1912*)

Special and Mongrel Red-Metal Mixtures.

The red metal mixtures given in the previous articles comprise those in common use and form a list sufficiently large for all ordinary brass foundry practice. There are, however, a number of other red metal mixtures that may be called "standard" and which are used for special purposes. Some of them are more or less "mongrel" although they have been found useful.

Among the special mixtures are the phosphor-bronzes. They are red metal mixtures very extensively used, both for work requiring strength and for bearings where a good bearing surface is necessary. A phosphor-bronze is, in reality, a tin-bronze with a little phosphorus added. In a true phosphor-bronze no zinc should ever be used. If it is, the amount of phosphorus must be cut down to a very small quantity (a few hundredths of a per-cent) and the mixture then becomes a composition or gun-metal. Those who wish to make phosphor-bronze successfully should, by all means, leave out the zinc and use copper and tin only with the small amount of phosphorus necessary.

There are really but two standard mixtures of phosphor-bronze in general use. They are as follows:

1. For ordinary castings which require strength and soundness.
2. For bearings.

The mixture for ordinary work is made as follows:

Ordinary Phosphor-Bronze Mixture

Copper	90 lbs. or 900 grams
Tin	5 lbs. or 50 grams
5% Phosphor Tin	5 lbs. or 50 grams
Total	100 lbs. or 1000 grams

In case phosphor-copper is to be used in place of the 5% phosphor-tin (it gives equal results), the following mixture is to be used:

Copper	87½ lbs. or 875 grams
Tin	10 lbs. or 100 grams
10% Phosphor-Copper	2½ lbs. or 25 grams
Total	100 lbs. or 1000 grams

For bearings, the following mixture is recommended:

Phosphor-Bronze Bearing Mixture

Copper	80 lbs.	or 800 grams
Tin	5 lbs.	or 50 grams
Lead	10 lbs.	or 100 grams
5% Phosphor-Tin	5 lbs.	or 50 grams
Total	100 lbs.	or 1000 grams

If phosphor-copper is to be used in place of the 5% phosphor-tin, which will give equally as good results, then take the following amounts:

Copper	77½ lbs.	or 775 grams
Tin	10 lbs.	or 100 grams
Lead	10 lbs.	or 100 grams
10% Phosphor-Copper	2½ lbs.	or 25 grams

In phosphor-bronze for bearings, the lead is used for imparting the necessary anti-frictional qualities.

There is another phosphor-bronze mixture that is used for resisting acids, such as those which exists in mine waters, sulphite liquors used in the manufacture of wood pulp for paper, and other weak acid waters. The bronze, however, is useful only for resisting water containing sulphuric acid as other acids act upon it. The large amount of lead it contains imparts the acid resisting qualities to it. The mixture is as follows:

Mixture for Acid Metal

Copper	75 lbs.	or 750 grams
Tin	5 lbs.	or 50 grams
Lead	15 lbs.	or 150 grams
5% Phosphor-Tin	5 lbs.	or 50 grams
Total	100 lbs.	or 1000 grams

In case phosphor-copper is used in place of phosphor-tin, then take the following:

Copper	72½ lbs.	or 725 grams
Tin	10 lbs.	or 100 grams
Lead	15 lbs.	or 150 grams
10% Phosphor-Copper	2½ lbs.	or 25 grams

Among the so-called "mongrel mixtures" is one known as antimony-bronze. It is simply a composition in which a portion of the tin is replaced by antimony. The object of this replacement is one of cheapness as the bronze is not as good as when no antimony is present. The antimony does not give as strong a metal although the casting properties are good when it is used. The wide difference in price between tin and antimony has been instrumental in this bronze being more or less used for some classes of work. The antimony acts similar to the tin and does not change the color of the mixture. It has the same color as when no antimony is used. The following is the mixture:

Antimony Bronze Mixture

Copper	85 lbs.	or 850 grams
Tin	1¼ lbs.	or 12½ grams
Zinc	10 lbs.	or 100 grams
Lead	2½ lbs.	or 25 grams
Antimony	1¼ lbs.	or 12½ grams

Among the special mixtures of the so-called red-metals is one used for making bronze dies. This, however, has a yellow color but as it consists principally of copper and tin, it really belongs to the red-metal group. Bronze dies are extensively used for stamping soft metal goods and soft, thin brass and copper. The fact that they can be cast nearly to the finished size or design and demand but little finishing or chasing, renders them attractive to manufacturers who know the heavy expense attending the making of a steel die. The following mixture is an excellent one and is extensively used in a number of large establishments:

Copper	85 lbs.	or 850 grams
Tin	14⅞ lbs.	or 148¾ grams
Aluminum	⅛ lb.	or 1¼ grams
Total	100 lbs.	or 1000 grams

The hardness of this bronze die mixture is quite satisfactory for ordinary chasing and it is not a difficult matter to finish the casting. The aluminum is used in the mixture to impart good casting qualities. Mixtures containing aluminum do not cut or flux the sand. In other words, the sand does not "burn" on to them, and there is obtained a very smooth casting true to the pattern. The shrinkage of this mixture is quite small and there is no need, as must be done with aluminum-bronze dies, of using heavy risers to compensate for it.

In a German patent, issued in 1881, to E. Schroder (19,720) a durable nickel plated sheet steel or iron may be made in the following manner: The sheets are first nickel plated by electrodeposition, and then rolled to obtain the smooth surface and "roll the nickel into the metal." A nickel coating of 0.1 millimeter is deposited.

Brass and Bronze Plating Solutions and How to Make Them.*

Sixth Paper.†

The Free Cyanide.

The maintenance of the free cyanide at the right amount is one of the most important things in running brass and bronze solutions, and if it is not observed, then difficulty will always follow. As a usual rule, it is the principal difficulty and many platers, especially those who are beginners in the art of plating, are very apt to make the mistake of using too little free cyanide. When this is the case, then the anodes coat over, the current is impeded and the brass deposit changes color. When multi-colored brass deposits are obtained, then it will invariably be found that the anodes are coated and the current becoming hindered from passing, the deposit may show red, white and yellow on the same article. The reason for this will be explained later.

By free cyanide is meant that over and above necessary to dissolve the carbonates of copper and zinc used in making up the solution. Free cyanide is necessary to keep the anodes clean. From experience and experiments it has been found that about 4 oz. of free cyanide to each gallon of solution is about right. A little more will do no harm, but much less will not keep the anodes clean. The right condition is when just enough free cyanide is present to keep the anodes clean and no more.

As stated in previous papers, the method of making a brass or bronze solution is to first make a copper solution by dissolving 1 lb. of cyanide in 1 gallon of water, then adding all the carbonate of copper it will take up so that no free cyanide will be left. Next adding 4 oz. more of cyanide for free cyanide, and lastly adding, in small quantities at a time until the right color has been obtained, a zinc solution made by saturating a cyanide solution with carbonate of zinc. In this manner, the strength of the cyanide, the variation in the strength of the carbonates and any other uncertain quantity are overcome. There is obtained a brass solution containing exactly 4 oz. of free cyanide to each gallon. This is by far the best method and is one which never fails.

As previously mentioned, a solution which contains too little free cyanide soon causes the anodes to coat over and in the illustration is shown one which became coated on this account. If the solution contains no free cyanide at all, then the anodes coat over very rapidly; but, on the other hand, if the free cyanide is almost sufficient, then they will coat over very slowly. The current strength, the temperature and the character of the anodes all have a bearing upon the rapidity of the coating, but they are all dependent upon the amount of free cyanide present. The time is the only factor which enters, for no matter what the conditions are, whether the solution is used hot or cold, whether the current density is high or low, or whether copper or brass anodes are used, unless sufficient free cyanide is present, the anodes will not remain clean.

The indication of insufficient free cyanide is the surface of the anodes. The inexperienced plater must not confuse a slight film or slime on the surface of an anode for one left by lack of free cyanide. Even though there may be plenty of cyanide present, a slight film is present on the anode, in some cases worse than others, on account of the character of an anode. For instance, if brass anodes are used and the brass contains iron or lead (or both) these metals are not dissolved by the cyanide, but are left on the surface as a slight film. The coating left by insufficient free cyanide in the solution is thick and pasty and needs to be seen only once to be remembered. It may be wiped off from the surface of the anode by the finger and has the feeling of a soft paste.

Difficulties Caused by Too Little Free Cyanide.

The difficulties caused by too little free cyanide are:

1. The coating over of the anodes. This is also the indication of the difficulty.

2. The formation of different colored deposits on the same article while the electrodeposition is going on.

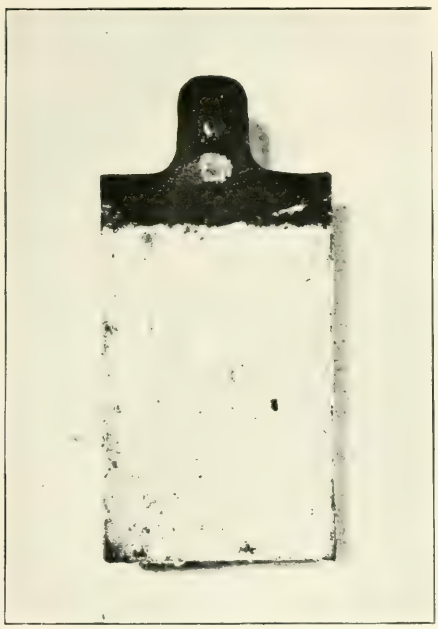
3. Slowness of the deposit.

The different colored deposits caused by the lack of free cyanide and the accompanying coating over of the anodes are a very com-

*Continued from THE BRASS WORLD, May 1912, page 170.

†These papers will be continued.

mon occurrence, particularly in the case of platers who have had no experience with brass solutions. The anodes first begin to coat over, then the different colored deposits make their appearance. It frequently happens that copper, brass, bronze and zinc are all deposited upon the same article. The reason is very simple. The coating that forms on the surface of the anode acts as an insulator and prevents the passage of the electric current. This coating, however, does not form at once, but gradually so that the current likewise gradually falls. As a certain current density is necessary for a certain color, the varying



Anode Coated Over with Slime from a Brass Solution on Account of Absence of Sufficient Free Cyanide.

current strength produces varying colors. It will be found that as the current becomes weaker and weaker, the tendency is towards copper until finally copper only is deposited. To the beginner, this may seem that the solution is deficient in zinc, but this is not the case. The solution needs only free cyanide, and in sufficient amount to keep the anodes clean.

Difficulties Caused by Too Much Free Cyanide.

Difficulties are caused by the use of too much free cyanide as well as too little. As the amount of free cyanide increases, the brass deposit becomes paler in color until it is possible, without changing the amount of zinc in the solution to deposit zinc. Therefore, if a uniform color is necessary the free cyanide must be kept at about the same amount continuously.

As the amount of free cyanide is increased, the deposit forms slower and slower until no deposit at all is produced. Many platers have noticed that, although there may be sufficient copper and zinc in the solution, the brass deposit forms slowly and does not increase in thickness as rapidly as desired. This difficulty is caused by too much free cyanide and can be remedied by adding more carbonates of copper and zinc.

There is still another phenomenon caused by the presence of too much free cyanide and this is the formation of blisters. When there is an excess of free cyanide in the solution, gas is given off from the articles being plated quite rapidly. This fact is one of the causes of blisters, particularly on smooth surfaces or those which have been insufficiently cleaned from grease.

The difficulties caused by too little or too much free cyanide may be summed up as follows:

Anodes Coat Over. Cause: Too little free cyanide in the solution. Remedy: Add just enough cyanide dissolved in water to clear the slime from them.

Brass deposit has several different colors. Cause: Too little free cyanide. Remedy: Add sufficient free cyanide to clear the surface of the anodes. Nothing more is necessary.

Deposit forms too slow. Cause: Too much free cyanide. Remedy: Add enough carbonate of copper and zinc to take up or neutralize the excess of free cyanide.

No deposit forms although gas is given off freely from the work. Cause: Too much free cyanide. Remedy: Add carbonates of copper and zinc.

Brass deposit is blistered. Cause: May be too much free cyanide although too strong a current or imperfect cleaning of the work may enter also.

Cadmium is one of the most extensively used. About 5 parts in 1000 of sterling-silver are used, and it is introduced when the silver and copper, used for the mixture, have been melted.

A French Method of Making Flat-Ware Blanks Without Scrap.

A new method of making flat-ware blanks, of German-silver or other metal, without the formation of scrap has been patented by Arthur Wilzin of St. Ouen, Seine, France. In the ordinary method of making spoon-

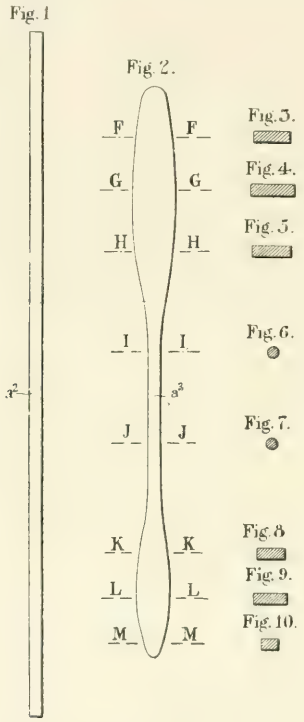


Plate 1. The First Stage in Making a Spoon.

blanks or similar flat-ware blanks, they are cut from sheet with the formation of from 50 to 60 per-cent scrap. This has to be remelted and is returned for this purpose to the rolling mill that rolls the metal.

In the French method a rod is used, such as that indicated in Fig. 1. By a grading process, this rod is formed into the shape shown in Fig. 2, cross-sections of which are indicated in Figs. 3 to 10. This is really a flattening at the ends of the rod and may be accomplished by hammering, pressing or other operations if desired.

The next operation is the formation of the blank shown in Fig. 11, the side view of which is seen in Fig. 12. Cross sections are shown in Figs. 13 to 16. This shape of the blank is produced by cross-rolling or grading transversely. The spoon is then ready for the formation of the bowl under a drop.

(A method similar to this was at one time in use in the United States, but, although it

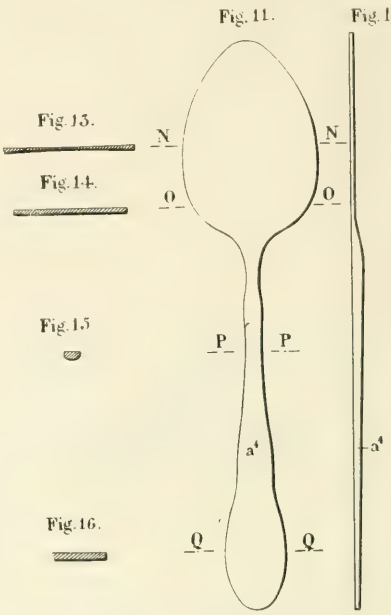


Plate 2. The Last Stage in the Process.

reduced the scrap to a very small amount, it was found that the labor cost of making the blanks was so high as to be prohibitive. —*Editor.*)

A Lead and Copper Anti-Friction Metal.

A new lead and copper anti-firiction metal has recently been patented (U. S. Patent, 1,024,561, Apr. 30, 1912) by John J. Davoren of Denver, Colo. The alloy used consists of the following:

Lead	50 lbs.
Copper	50 lbs.
Arsenic	½ lb.
Phosphorus	1 oz.

It is stated that this alloy is adapted for bearings and similar purposes. The phosphorus is added to render the mass more fusible and the inventor states that the arsenic imparts a fine grain to the metal. If desired it may be omitted. The copper is melted and the lead added, after which the arsenic and phosphorus are introduced.

The Vaughan Hughes Method of Annealing Metals Without Oxidation.*

As the reader may already know, the Vaughan Hughes furnaces for annealing are not confined to the treatment of the non-ferrous metals and alloys alone, but are extensively employed for the bright annealing of the ferrous metals and alloys such as iron and steel.

Fig. 1 shows a furnace which has been erected for a well known motor-car firm in London, and is employed in case-hardening, normalizing, annealing, toughening and hardening steel goods, and also normalizing phosphor-bronze castings. The great feature of this furnace is that practically finished articles are normalized, toughened or hardened without oxidation. The temperatures of the furnaces are perfectly even and easily maintained.

This furnace block consists of three muffles, each of which is 3 feet wide. They are heated by the gas generated in a producer at the back of the furnace forming part of the furnace structure. The brick work is substantially encased in cast-iron framework. The results obtained are very gratifying and consistent.

Fig. 2 exhibits one of the first furnaces altered and which is in use day and night carrying out the same operations as No. 1. The producer attached to this furnace is shown sunk below the level of the ground. In the furnace shown in Fig. 1, the producer is above the ground as the underlying foundations permit of no other arrangement.

Fig. 3, exhibits a furnace at work bright annealing copper wire, silicon-bronze, manganese-bronze and other high content copper alloys used in the electrical industry. The output of this furnace is 10 to 15 cwts. per

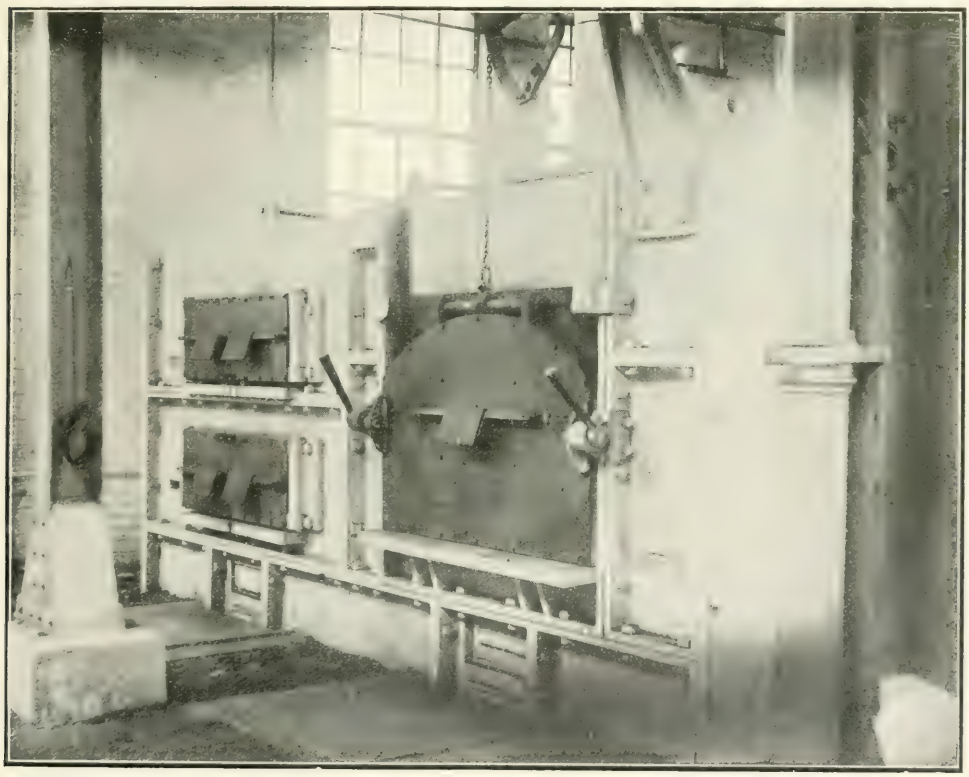


Fig. 1. Vaughan-Hughes Furnace Used by a London Automobile Manufacturer for Case Hardening, Annealing and Similar Work.

*The inventor of this Process is T. Vaughan Hughes, consulting metallurgist, 130 Edmund St., Birmingham, England.

hour depending upon the weight of coils placed upon the conveyor.

The photograph shows the annealed wire with its bright sheen intact. In fact it is very difficult to distinguish at a short distance away the difference between the hard and the annealed wire, which is dead soft. The users of this furnace inform the inventor that the annealing results are very satisfactory and that the physical tests applied to the wire are particularly gratifying. In this furnace only one water seal is used and that is simply and solely for the purpose of handling the wire quick-

Fig. 2. One of the First Furnaces Erected and Now in Regular Operation in Annealing.

ly. As a matter of fact the water seal is really not necessary. The bright and hard goods do not pass through any liquid seal into the furnace.

In all the recent forms of the Vaughan Hughes furnaces, iron muffles are entirely dispensed with, although in the one shown an iron muffle forms part of the equipment, but by the method of firing it does not come in contact with combusted gases and in fact is entirely surrounded by non-oxidizing gas. Thus its life is considerably increased and a very even temperature is attained throughout the whole length of the muffle. The power required to drive this furnace is merely nominal.

Another special feature is that the conveyor is in sight, except when in the furnace and trunks, and is, therefore, under inspection while in operation. The drive is continuous and not in jerks, so that the metal when annealing is subjected to no vibration, shock or jarring—a most important point in bringing about consistent results in the physical tests to which the material annealed in this furnace is subjected after being made dead soft.

Fig. 4, exhibits a type of furnace which is working day and night annealing steel hollowware stampings between processes without oxidation. The goods are nested in the trolley shown and are pushed into the furnace. Another trolley is brought by usual appliance to the front and charged. When the first charge is annealed the second fully charged trolley is propelled into the furnace and pushes the heated trolley with its contents into the cooling chamber at the back of the furnace. A third trolley is now brought to the front and charged. The cooling chamber being so designed that the rate of cooling is under control, the first charge annealed is ready for handling in less time than it takes to heat up any one charge, consequently the cooling chamber can be emptied of its charge before the third charge is ready to be pushed into the furnace.

Both the cooling chamber and the furnace are filled with an inert gas so that while heating and cooling the goods are out of contact with the air.

The operation just described is repeated without ceasing day and night. The output of the furnace is very large.

This type of furnace is also used for annealing tubes up to nine metres in length. Large equipments are being erected in Europe at the present moment under this system for annealing steel boiler tubes for warships and mercantile marine vessels, and also for brass and copper tubes, in units of two and three tons per hour. A similar type of furnace is used for annealing steel wire in coils with an output of 100 tons per week.

In addition to all this the inventor has furnaces for annealing steel wire continuously up to a rate of 170 ft. per minute. These furnaces are arranged so that the wire is not oxidized while being annealed "end-on", and is continued through a fluxing bath and a galvanizing pot so that the annealing of the wire and its galvanizing are effected continuously without intermission at high rates of speed. The saving in the loss of material in scale alone on a large output of 2 tons per week is sufficient to amply pay interest and depreciation on the cost of the plant and leave a considerable margin towards fuel costs. The saving in acid and time is also very considerable.

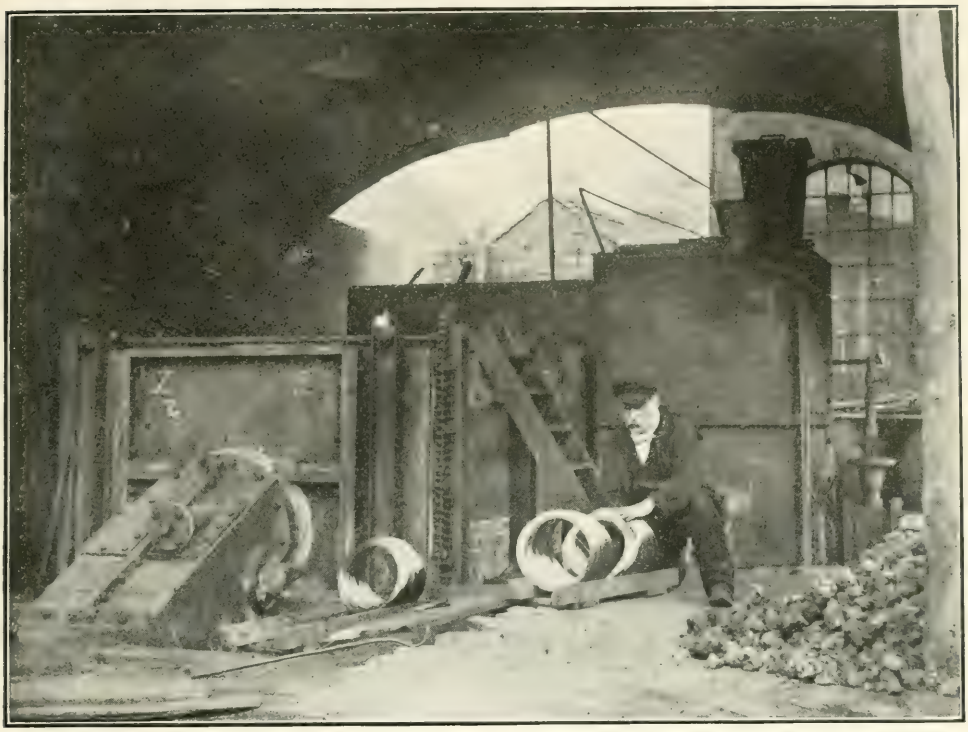


Fig. 3. Vaughan-Hughes Furnace for the Bright Annealing of Copper Wire and Other Copper Alloys. Output from 1000 to 1500 lbs. per hour.

Fig. 4. Type of Furnace Now in Continuous Operation Annealing Hollow-Ware Stampings.

Needless to say all these furnaces are perfectly smokeless when in action and can be adapted to burn natural gas or oil. The cost of repairs is remarkably low because the methods of construction are, the inventor believes, a departure from what has been done in the past. Great care has been taken in the design of the producers and of the internal structure. No pains have been spared or improvement that science can suggest, without going to extravagant outlay, have been omitted in the design of these furnaces.

In conclusion, the above furnaces are peculiarly applicable for heat-treating large sheets of copper or aluminum, and some equipments are now under consideration for heat-treating sheets 20 ft. long and 15 ft. wide.

It is believed that the inclusion of good refractory material and a little extra trouble and care in the erection of a furnace, good substantial design and avoidance of heat losses, all of which add somewhat to the first initial cost, pay best in the end. The inventor claims, and experience has confirmed that the cost of working and, therefore, the saving have

amply covered the interest on this extra capital outlay. The furnaces give more satisfaction than is usually the case.

Besides all this, recent researches and work on non-ferrous metals and alloys have proved what has been previously discovered for steel that the heat-treatment necessary to undo the effect of mechanical work is a very different proposition from that necessary to bring about internal constitutional changes and the best possible mechanical properties of the non-ferrous metals and alloys in their daily application.

Large sums of money are expended in improving mechanical processes to reduce cast non-ferrous metals and alloys to various forms of sheets and wires with the greatest expedition, but little care seems to have been taken to reduce these metals and alloys to the best internal condition before any mechanical work is put upon them.

As the undoing of this mechanical work requires a heat-treatment measured by hundreds of degrees lower than that necessary to alter the internal structure of the metal, it is time that manufacturers' attention should be drawn to these newer discoveries and that a little more consideration should be given to the furnace-equipments. As an instance of the effect of heat-treatment as distinguished from mechanical work, the results of investigations on the aluminum-zinc and copper alloys are perhaps most noteworthy. Then again, the temperatures for re-heating now limited to a few degrees, by researches as demonstrated by the curious behaviour of some of the non-ferrous metals and alloys at what were considered to be proper re-heating temperatures, are worthy of close attention.

In fact all recent work proves beyond the shadow of a doubt that re-heating furnaces for non-ferrous metals must be capable of nicest temperature regulation. They must be so constructed that a predetermined temperature cannot be exceeded, that the internal atmosphere of the furnace must be such that the metal or alloy can remain in the hot space for considerable periods of time without oxidation or suffer other deterioration in order that they may be "normalised", that the furnace may have attachments that the metal on withdrawal can be quenched, if necessary, after the charge has dropped through certain temperature intervals, and lastly that the temperature and time for undoing mechanical work must be considered separately and entirely different from that necessary to bring about the proper constitutional changes and the best structure in a metal or alloy in course of manufacture.

Removing Old Nickel Deposits.

There are many instances where it is necessary to remove an old nickel deposit, either from the fact that it is not good or it is desired to plate over it. A stripping dip is often used on brass goods that have been nickel plated, but it is not very satisfactory upon some classes of work for the reason that it is apt to leave the surface more or less pitted, and then for large work it requires a large quantity of dip which may have to be thrown away after using once or twice. The strip, therefore leaves much to be desired.

For removing the nickel deposit from nickel plated work a very satisfactory method is to cut it off by means of a tampico wheel and emery paste. A tampico wheel is preferable to a bristle wheel as it cuts faster with the emery paste. Apply the paste to the wheel and then cut off the nickel from the work as though the surface is to be polished. The wheel will cut rapidly and the surface will be left in a good condition for further treatment. After the nickel has been removed, the surface may be cut down with tripoli for further plating and if necessary finished with rouge or other buffing composition.

The advantage of removing the old nickel deposit from nickel plated work with a tampico and emery paste is that any kind of articles may be treated. It makes no difference whether they are brass, iron or steel, the result is the same and very little subsequent treatment is required to bring the surface of the base metal to a condition for re-plating.

An ordinary iron rod is not the best shape for stirring metals in crucibles. The action of the metal gradually changes the end of the rod to a sharp point so that, when the metal is stirred, the bottom of the crucible is apt to be injured. The best form, and one used in the best brass practice, is a rod, upon the end of which is a lump, formed either by welding on a piece of iron, or by upsetting the end. This form prevents injury to the crucible, and the metal is also mixed more thoroughly with it.

A New Method of Eletrodepositing Nickel and Iron Together.

A new method for the simultaneous electrodeposition of nickel and iron has recently been patented by August Leuchter of New York City (U. S. Patent 1,026,627, May 14, 1912). This is accomplished, according to the inventor, in a peculiar manner. The solution used is one of iron, while a nickel anode is used. It is claimed that this will enable a plater to deposit the nickel and iron together on an object and which will be hard and resisting. Its use for making electrotypes is given as the principal one, and the fact that when such electrotypes are used in place of those of copper, ordinarily employed, the life is very greatly increased, renders them valuable to printers. They are already in use and are known as "steel faced electros" or "nickel steel electros." The deposit is called, on account of its hardness, "nickel steel." The inventor describes his process as follows:

"Electrotypes or electros, as is well known, have usually been obtained by the deposition of metallic copper upon the graphitized or prepared surface of a mold or case from which the sheet or plate, when of suitable thickness is stripped. The objections to copper electros, arising from the comparative softness and coarseness of grain of that metal when electrolytically produced, have been fully recognized, but the numerous attempts to produce electros of other and harder metals have usually been attended by failure or at least, with results of doubtful practicability and value.

I have succeeded in producing electrolytically, printing surfaces and electrotypes generally by the simultaneous deposition of two metals in what appears to be an alloy of both, and which are greatly superior to the ordinary electros, by reason of their hardness, tensile strength, flexibility, fineness of texture and great durability, but in reaching this result I have found that practical success depends upon the maintenance of conditions and the observance of precautions not adopted or followed in previously known processes, and not apparently recognized as essential to the attainment of such results.

In the preferred manner of carrying out my invention I use a tank of the ordinary kind with provision for the suspension therein of the mold or other article upon the surface of which the metal is to be deposited. In conjunction with such mold, and its conducting surface as a cathode, I use an anode of nickel, and an electrolyte containing an iron salt, preferably sulphate of iron.

It is well understood by those skilled in this art, that certain definite relations of anode and cathode, particularly with respect to spacing, manner of suspension, and surface contact with the electrolyte are necessary for economical and successful operation, and it is of primary importance that all of these should be observed and secured. In addition to this, however, I have found that it is essential to so determine and adjust the resistance of the bath as a whole with respect to the impressed electromotive force of the circuit arbitrarily fixed by practical conditions and limitations, that the effective voltage shall have a value intermediate to the higher voltage necessary for effecting the deposition of nickel, and the lower voltage suitable for the deposition of the iron. These conditions I have found to be obtainable only by using the metal of higher resistance as an anode, and the metal of lower resistance in solution in the electrolyte, and by so making and arranging the anode that its rheostatic effect will reduce the impressed electromotive force to that value. For example, having established in other respects the proper conditions and relations for a given bath, I employ a source of current giving an electromotive force of five volts, and use an anode of nickel having a rheostatic effect sufficient to reduce the electromotive force to three volts, a value somewhat in excess of that necessary for the deposition of iron and somewhat below that ordinarily necessary for the deposition of nickel, but which under the conditions secured by the particular combination under consideration I have found to be capable of effecting the deposition of both metals simultaneously.

It is manifest that in carrying out the process above described, nickel from the anode will go into the electrolyte, although it will not unduly accumulate because of the rate at which it is deposited. It is essential, however, that the iron should at all times predominate in the electrolyte and hence loss of iron by electrolytic action must be compensated for by the addition of fresh solution so

as to preserve a substantial preponderance of iron over nickel in the electrolyte. This discovery has proved of the greatest value and importance in the art of producing on a commercial scale, electrotypes of harder metal than copper, for while it is possible to deposit both nickel and iron simultaneously by the use of either an iron or a nickel anode in a bath containing nickel or iron respectively in solution, unless the conditions above prescribed are established and maintained, the action is not capable of being prolonged beyond a limited time, after which the quality of the deposit deteriorates, by reason of the preponderance of one of the constituent metals in the plate, which may become so great as to result in the deposition of one to the total exclusion of the other."

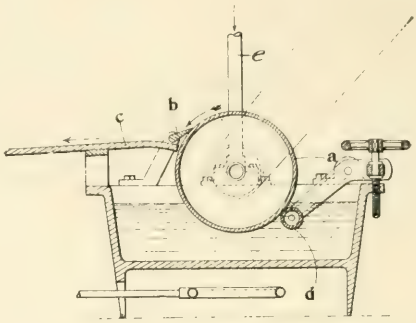
The Production of Films or Sheets of Soft Metal by Spinning.

A method for the production of thin sheets or films of metals by spinning has been brought out by Wm. G. Wagner of London, England. The process is described by him as follows:

"According to the invention I produce a film of the metal by the movement of a body within a bath of the metal in its molten state, the body being advantageously of circular or cylindrical form and having a surface of such a nature and maintained at such temperature that the metal adheres to it on contact, so that on the movement or rotation of the body a continuous film is formed thereon, and it is then only necessary to provide convenient means for separating the film from the body on its movement, for the purpose of continuous production of the film or thin sheet metal.

In the accompanying drawing is illustrated a constructional form of the apparatus for carrying out the process.

The invention is more especially conceived in its application to lead, tin, zinc and other fusible metals or alloys and is conveniently carried out by the employment of a drum or hollow cylindrical body *a* having a peripheral surface of polished wrought iron, means being provided for maintaining the body at the temperature proper for the effectual deposition upon it and adhesion to it of the film of the metal by suitable internal or external cooling, or, if necessary, by heating. The metallic sheet or film which may be of any desirable width may be removed from the drum by means of a doctor blade *b* or other appliance and it may then pass over a roller, slope or carrier *c* or be otherwise conveyed away for use or for further treatment.



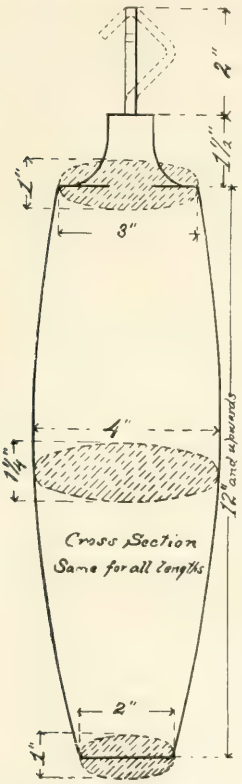
Sketch Showing Method of Making the Films or Sheets.

In some cases the metal may detach itself without the use of special means for the purpose, or the film may be passed between rollers, which, while reducing its thickness and increasing its uniformity or otherwise preparing it for its ultimate use may also cause the pull on the film to bring about the rotation of the drum or cylindrical body. Again, for the purpose of maintaining regularity of surface and thickness of the film, a roller, bar or other device *d* may be provided actually within the bath of molten substance and beneath the drum or hollow cylindrical body, around which the deposition is to be effected, which roller or other device is set at such distance from the drum, as to secure the production of a film of the required thickness. Means may be provided to apply the necessary heat to the roller or other device aforesaid, such, for example, as by means of a pipe *e*. As or before the metal leaves the drum it may be annealed by any suitable means such as a flame or other heater before the rolling or other treatment to which it is to be subjected."

Cobalt resembles nickel in its properties and is equally as non-corrosive. It can be deposited from its double sulphate solution in the same manner as nickel.

The "Economy" Form of Anode.

A new form of anode has recently been placed on the market by the Harshaw, Fuller & Goodwin Company of Cleveland, Ohio and 100 William St., New York City. This anode is called the "Economy" by them and is the invention of George L. Wallace eastern representative of this company.



The "Economy" Form of Anode.

It was for years noticed that the greatest amount of wear on an anode was around the center and this was all the more noticeable when work of unusual length or baskets were used in the plating tank. The "Economy" anode was designed to overcome this difficulty and it will be noticed from the illustration that the largest cross-section is in the middle where the greatest wear comes so that the wearing away will take place evenly.

The anodes are made in all lengths and are supplied with the V shaped hook so that all sizes of anode rods can be used without interfering with the connection. As there is always a large amount of waste in anodes, it is believed that this new shape will reduce this loss to a very considerable amount; and it is all the more interesting for the reason that the cost of the anode is not increased.

Welding Brass by the Oxy-acetylene Blowpipe.

Considerable difficulty has arisen from time to time in making fusion-welds between pieces of brass, much of the trouble arising from the scorching of the metal. The *Union de la Soudure Autogene* has had the matter under examination, and M. R. Amedeo, who has delt with it, explains some of the causes of failure and how these may be avoided.

Two qualities of brass must be distinguished: the first quality, containing 65 to 70 per cent. of copper, cannot be worked while it is hot; the second quality, which can be forged, containing 58 to 60 per cent. of copper. In making welds, the added metal should be of the same sort as that of the pieces to be joined; welders are sometimes led astray by the term "second quality," and use the first sort of brass for joining the second, the result being that the work, instead of being improved, is of bad quality, for the added metal has a higher melting-point that that of the pieces it is desired to unite. Added to the trouble of carrying out the process the resulting weld has mechanical properties differing from those of the rest of the metal.

Two great difficulties are encountered in effecting the fusion welding of brass. In the first place the molten metal has great fluidity, which requires considerable skill on the part of the operator, otherwise gaps are produced in the line of the weld, and frequently all that results is a sticking together of the two pieces of metal instead of the production of a proper joint. Secondly, there is a loss of zinc, an easily volatile metal, during the operation of welding. Under the blowpipe the vapor of the oxide of zinc is given off in considerable quantity, and in working brasses with the lowest percentage of copper, this impoverishment in content of zinc makes itself especially felt, the operation of fusion being upset to the extent of the molten metal thickening, swelling up, and becoming scorched. A powerful blowpipe should be used in welding brass in order to shorten the time occupied, and allow of free

fusion of the edges to be joined; a beginner will make holes in this way, but he gets used to the jet he must use and eventually sound welds can be made after acquirement of the necessary practice. The fumes of zinc oxide given off during welding are injurious; as antidote M. Amedeo recommends a considerable quantity of milk.

The *Union* has found two types of metal which can be added in making welds between pieces of brass of one or other variety. It is said that by their use burning of the metal can be avoided, and that it is impossible to scorch the line of welding unless the blowpipe be used in immoderate fashion. These metals added during the process are said to suppress entirely the white fumes of the oxide of zinc, even when two pieces of brass of the second quality containing the lower percentage of copper are being joined; flaws are not produced, and, after annealing, the properties of the weld are similar to those of the neighboring portions of metal. It is stated that no lead is contained in the metal to be added, as this materially increases the chances of burning, the small quantity of lead usually added to brass being for the purpose of rendering the metal more suitable for turning.

In melting brass under the blowpipe the operation should be conducted rapidly. Frequently foreign material hinders this, and necessitates too prolonged heating with the blowpipe. Holes are possibly produced thereby, and in any case an alteration of the alloy results. On the other hand, the presence of a very thin layer of slag will condition a mere "sticking together" of the pieces instead of a proper weld, as, the work being carried out rapidly, slag has not time to escape from the molten metal and come to the surface. Hence a good flux is a necessity. Borax is not quite convenient, and a more effective but quite cheap powder has been devised. The added brass is of a different quality from that of the metal joined, but a slow annealing at 650°C. renders the whole uniform. Annealing at too high a temperature is a mistake. It it is wished to make a very resistant joint, it is well to hammer the weld before annealing. It should be remembered that with the first quality of metal the hammering is to be done in the cold, with the second when the metal is hot, and should cease as the metal cools, since it is very brittle about 400 C.—*The Ironmonger.*

Why Manganese-Bronze Castings Leak Under Pressure.

The extensive use of manganese-bronze at the present time and the fact that it is a strong metal has been responsible for the troubles of many brass founders. An order is received for castings to be used for hydraulic work, high air pressure or similar goods. The brass founder immediately thinks of manganese-bronze as the suitable mixture from the fact that it is the strongest one that he makes. The very fact that the metal must stand a high pressure renders it necessary, in his own mind, that a strong bronze must be employed. He does not stop to realize that the pressure to be used has nothing at all to to with the strength of the bronze, but upon the design of the casting. Were it made sufficiently thick, babbitt-metal or solder could be used. The order may, however, specify manganese-bronze, and if this is the case, then, of course, he gives the matter no thought, but starts in to use it. In either instance, accordingly, the effect is the same and the casting is made out of manganese-bronze.

The castings made, they are shipped to the customer who machines them and then proceeds to test them. A large percentage, and not infrequently all of them, leak. The castings may look perfectly sound, not a blowhole or flaw in them, but yet they leak. The unfortunate brass founder then imagines his heat of pouring or his mixture is wrong, and, although the profit is already gone from the job, he makes the castings again, but with the same result. Perhaps a smaller percentage of them leak this time and then he believes that his pouring heat was at fault and he may make another trial. He usually finds within a short time, however, that he cannot obtain a sufficient number of good castings which do not leak to warrant filling the order and he then usually "throws up the job."

The reason that manganese-bronze castings leak in this manner is on account of the aluminum in them. They cannot be made, however, without the aluminum so that the brass founder is really between the "devil and the deep sea."

Aluminum, as now well known, oxidizes when melted and wherever exposed to the air. There is *always* a film of oxide on the metal when it is poured, and this film becomes intermingled with the molten stream and enters

the casting. So far, there has been no known method of keeping it out. Watch a stream of molten manganese-branze and see it go in! The oxide of aluminum, however, is whitte and while it can be noticed going in with the stream of molten bronze, in the casting, on account of its white color, it is not visible. The result is that the casting is filled with particles of oxide of aluminum, but which are not visible. When pressure is applied in testing the casting, these particles (they are frequently flakes as the microscope will show) form channels, on account of not uniting with the metal, through which water, air or other liquids or gases may pass. Hence the leakage.

The remedy is to make castings to stand pressure of a good copper and tin mixture that will cast without a film of oxide and give a clean metal. This has been the universal verdict so far.

The Cause of a Rough Deposit in an Acid Copper Solution.

Lift up a copper anode that has been running in an acid copper plating solution for some time and notice the slime that runs off from it into the solution. This slime is composed of very small particles of metallic material and they diffuse themselves through the solution. After a time, these particles become very numerous and the solution becomes badly contaminated with them. It is these particles that cause a rough deposit.

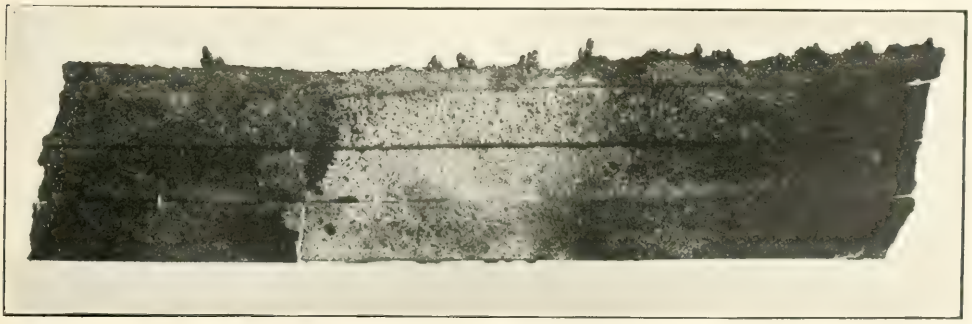
When copper anodes are dissolved in the solution while the plating is going on, the copper itself, of course goes into the solution. Copper is never absolutely pure. It contains small quantities of gold, silver, arsenic, antimony, bismuth, tellurium, selenium, and other metallic elements. When the copper is dissolved, while the plating is going on, those elements which are insoluble in sulphuric acid are left behind as the slime. They then float over into the solution and contaminate it. Being metallic they readily attach themselves to the copper deposit, and the copper building up around them forms the rough surface.

If a rough deposit from an acid copper solution such as that herewith illustrated, is examined under a microscope, it will be found that the roughness is caused by the formation of these nodule-like masses which, once formed, grow in their initial shape.

The remedy is to filter the solution as frequently as possible or allow it to settle and siphon off. This will remove the particles in the solution and when clear a much smoother deposit will be obtained.

Barium cyanide is, theoretically, the right substance for regenerating a silver plating solution. It decomposes the potassium and sodium carbonates, which comprise the main foreign matter (and which are produced by the decomposition of the cyanide) and converts them into cyanides again. At the same time, barium carbonate is formed which may be allowed to settle as it is inert, or may be filtered off.

For small castings, upon which a thread is to be cut, or machine work is to be done, an aluminum casting mixture composed of 82% aluminum, 15% zinc, and 3% copper is excellent as it cuts freely and does not clog the tool like the aluminum and copper alloys.



A Rough Acid Copper Deposit Produced by Sediment in the Solution.

Extrusion-Metal Chips as a New Scrap Metal Material.

A new scrap material has made its appearance upon the market and is now perplexing the unsophisticated scrap metal dealer. This new material is known as "Extrusion-Metal Chips." It results from the drilling, turning or other cutting operation in the machining of extrusion-metal.

Extrusion-metal is one of the comparatively recent materials that has made its appearance in the brass rolling mill trade. It has gained a firm foot-hold and its consumption is rapidly increasing. It has the advantage of cheapness and strength.

Extrusion Metal Chips.

Extrusion metal is a form of brass, but contains much more zinc than ordinary brass. The common mixture is 55% copper and 45% zinc. This produces a mixture that not only is strong, but is soft while hot. It can, therefore, be pressed or squirted through a die by hydraulic pressure. This is the method of making extrusion metal. A hot billet is forced out of any desired shape die by hydraulic pressure and issues in the form of a rod of the shape of the die. Owing to the large number of shapes that can be made, and the fact that the metal is much stronger than ordinary brass, has brought about a large consumption.

The chips resulting from the machining of extrusion metal have found their way into the scrap metal trade as yellow brass chips, but care will be necessary in preventing their entrance into legitimate yellow brass chips made from screw rod. The extrusion-metal chips contain so much zinc that they are not a suitable material for making ingot brass unless a large amount of copper is used. They also waste much in melting. An analysis of a sample of chips gave the following results:

Copper	56.10%
Zinc	43.90%

The chips are short and quite unlike yellow brass. The character may be appreciated by referring to the illustration. The color is also different from ordinary yellow brass, and it has a golden shade rather than the true yellow color.

Scrap metal dealers will have to be on the alert for there is a constantly increasing consumption of extrusion-metal which means that the scrap metal trade will have its share of it.

The National Electroplaters' Association.

On May 24th, the fortieth meeting of National Electroplaters' Association was held in the Grand Opera House Hall, 23rd.St. and 8th. Ave., New York City. Twenty-nine members and twenty-six visitors were present. The meeting was an open one and proved of much interest.

The installation of the new officers, recently elected, took place and a gold watch was presented to Charles H. Proctor, the retiring president, on behalf of the members in appreciation of his efforts.

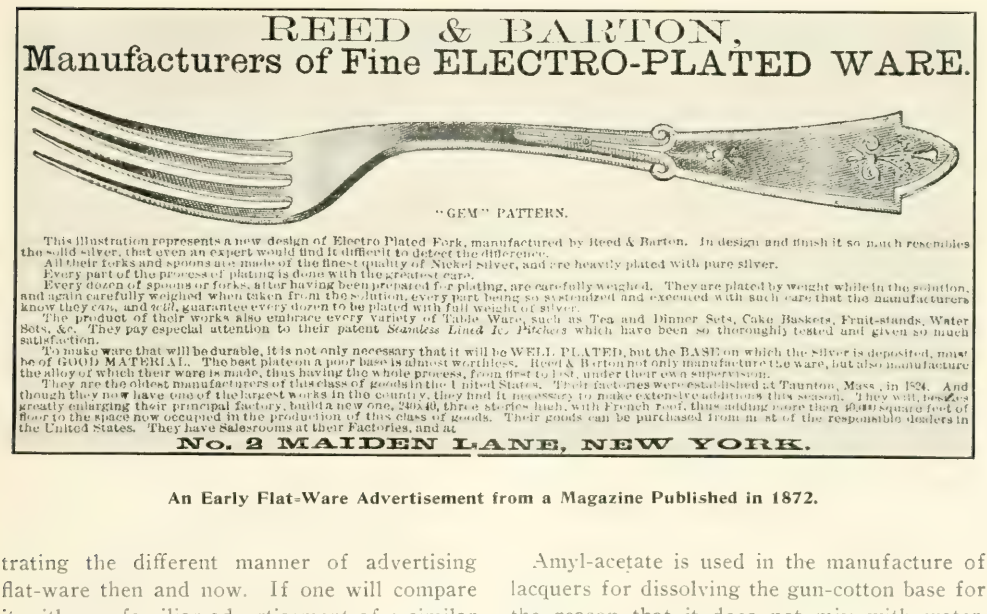
A number of new members were elected and a charter was granted to the Chicago branch. A number of addresses were made by members of the association. The new president, R. H. Sliter, was sworn into the office and delivered his well chosen address of acceptance, after which the other officers were installed. Addresses were then made by the retiring president, Charles H. Proctor, F. C. Clement, of the Philadelphia branch, E. S. Sperry, of THE BRASS WORLD, and Geo. B. Hogaboom whose remarks were very opportune and convincing. Mr. Hogaboom stated that manufacturers should support the Association for the reason that it tends to educate platers and so renders them of greater value in their business. Mr. Sperry called attention to the fact that other scientific bodies owe their existence to the value of their transactions which they publish, and unless a similar condition exists in the Association, members who are unable to attend meetings will not be able to derive benefit. The papers, which are published in the Quarterly, however, will supply them with matter of sufficient value to keep them.

An Early Flat-Ware Advertisement.

It is always interesting to look back and see the progress that has been made in many years, and also note the method of doing business then and now. Old pictures, invoices or advertisements are always of interest.

The accompanying reproduction is that of an advertisement which appeared in a publication called the *Aldine* and published in the early '70's. The issue from which this particular advertisement was taken was of the year 1872 so that it is now just 40 years since it was printed.

The advertisement is of interest as illustrating the different manner of advertising flat-ware then and now. If one will compare it with any familiar advertisement of a similar nature today as found in magazines and other periodicals, not only will the progress in illustration and typography be noticed, but the improvement in flat-ware design will be fully realized. The design shown in the reproduction would not be considered a good seller to-day, although it was one of the leading designs forty years ago.


REED & BARTON,
Manufacturers of Fine ELECTRO-PLATED WARE.
"GEM" PATTERN.
This illustration represents a new design of Electro Plated Fork, manufactured by Reed & Barton. In design and finish it so much resembles the solid silver, that even an expert would find it difficult to detect the difference.
All their forks and spoons are made of the finest quality of Nickel Silver, and are heavily plated with pure silver.
Every part of the process of plating is done with the greatest care.
Every dozen of spoons or forks, after having been prepared for plating, are carefully weighed. They are plated by weight while in the solution, and again carefully weighed when taken from the solution, every part being so systemized and executed with such care that the manufacturers know they can, and will, guarantee every dozen to be plated with full weight of silver.
The product of their works also embrace every variety of Table Ware, such as Tea and Dinner Sets, Cake Baskets, Fruit-stands, Water Sets, &c. They pay especial attention to their patent Seamless Lined Ice Pitchers which have been so thoroughly tested and given so much satisfaction.
To make ware that will be durable, it is not only necessary that it will be WELL PLATED, but the BASE on which the Silver is deposited, must be of GOOD MATERIAL. The best plate on a poor base is almost worthless. Reed & Barton not only manufacture the ware, but also manufacture the alloy of which their ware is made, thus having the whole process, from first to last, under their own supervision.
They are the oldest manufacturers of this class of goods in the United States. Their factories were established at Taunton, Mass., in 1824. And though they now have one of the largest works in the country, they find it necessary to make extensive additions this season. They will, however, greatly enlarging their principal factory, build a new one, 240x40, three stories high, with French roof, thus adding more than Four Square feet of floor to the space now occupied in the production of this class of goods. Their goods can be purchased from most of the responsible dealers in the United States. They have Salesrooms at their Factories, and at
No. 2 MAIDEN LANE, NEW YORK.

An Early Flat-Ware Advertisement from a Magazine Published in 1872.

Composition which shrinks "locally" (i. e. in spots) is deficient in tin. Steam-metal valves frequently show it, and when it is encountered, it indicates that there is not sufficient tin in the mixture.

The lack of care on the part of workmen in the lead trades in safeguarding their health is noted in an article published in the *Chemical Review* in 1882. The author says: "It is a lamentable fact that workmen in the lead trades neglect—we might say refuse to avail themselves of the precautions devised for the protection of their health. They will not drink the sulphuric lemonade which is given them to counteract the effect of the lead; they lay aside the respirators which would prevent the dust and fumes from being inhaled; and, after all, a certain class of newspapers persist in blaming the employers, and in denouncing modern science for not devising a remedy."

Amyl-acetate is used in the manufacture of lacquers for dissolving the gun-cotton base for the reason that it does not mix with water. The lacquer, therefore, does not turn white in damp air while drying.

Blisters on sterling-silver can be produced in annealing if the article being annealed is allowed to overheat in the muffle and it is exposed freely to the air. When produced in this manner, and it is a common fault in annealing sterling-silver, they are called "heat-blisters" to distinguish them from those which are actually in the metal itself (produced from blowholes) and are formed when the silver is melted.

Questions and Answers.

QUESTION No. 1149. I would like some information on how to make spelter castings in metal molds. These are statues, clocks, figures and candle-sticks. I have been working with pure Bertha spelter, but the castings are all cracked clear through and will not dump hollow. I have also used a mixture of zinc 50 lbs., lead 10 lbs., and tin 5 lbs., which has overcome most of the cracks, but it will not dump. The mold that has been used is the regular dump style and works well on other metals. We want to obtain something that is better than antimonial lead and something that is low in tin. Any information that you can give me will be appreciated.

Answer. If you cannot cast the Bertha zinc in your molds, then something must be the matter with the molds or the heat of pouring. Bertha zinc has been found the most satisfactory material for this purpose and is almost exclusively used for metal mold casting. The reason it is used is because it does not crack in the mold, so we infer that either your molds have not been well made or you are pouring the zinc at the wrong heat. Possibly you are not keeping your molds at the right temperature when you pour the zinc in them. We can suggest nothing better than Bertha zinc and it is very extensively used for metal mold casting.

QUESTION No. 1150. In our electrogalvanizing solution a black scale forms on the zinc anodes, and gradually dropping off, forms a thick layer on the bottom of the tank. Is this a natural cause and if not, can you give a reason for it?

Answer. The black scale that forms on your anodes is caused by the impurities in the zinc. It is composed almost entirely of lead. Lead is the principal impurity in zinc, and when the zinc itself is dissolved by the action of the current during the electrodeposition, the lead is not and is left on the surface of the anode as black, metallic lead. This gradually accumulates and becomes so thick that it drops off. If it is not removed from the surface of the anode, the current is impeded. It should be removed by brushing with a stiff, wire brush and the solution will then be kept in a more uniform condition. There is no way of preventing this lead coating except to use the purest zinc (even the highest refined zinc on the market contains from 0.02 to 0.05 percent of lead), and while this would remain clean much longer, it would sooner or later coat over as it, too, contains a small amount of lead. The best way is to purchase a good grade of commercial zinc anodes and clean them as frequently as possible. It will be found the most economical method.

QUESTION No. 1151. We are making a large number of valves to stand the high pressure of 6000 lbs. per square inch. We are making them out of the following mixture:

Copper	56 lbs.
Zinc	40 lbs.
Tin	½ lb.
Aluminum	1/3 lb.

These castings are in the form of a T and are 7 inches long and 2⅝ inches in diameter. There is a ⅞ inch hole through the casting, but this hole is bored and the casting is made solid. Why do these castings leak? The metal is the best quality of stock. Do we pour them too hot. Or do we put in the aluminum too soon? Can you give us some information covering this condition?

Answer. Your difficulty is not with the manner of casting but in the metal itself. Any mixture containing aluminum is unsuitable for work to stand pressure. While the metal itself, as far as tensile strength and elastic limit are concerned, leaves nothing to be desired, the fact that aluminum is present causes the leakage. Aluminum always oxidizes when melted. The oxide is practically invisible on account of being white. For this reason it is not conspicious, but it intermingles with the metal, however, and enters the casting. While the casting may have an excellent appearance, it may contain channels of oxide through which water can pass when the testing is done. While it is possible to obtain some good costings, yet so many leak it is not considered profitable to use mixtures containing aluminum for pressure work. It has been found far more satisfactory to use the tin bronzes as they cast well and the percentage of leakages is small. We recommend the following as suitable for your purpose:

Copper	88 lbs.
Tin	10 lbs.
Zinc	2 lbs.

QUESTION No. 1153. After brass tubing has been brazed it is covered with a black scale when it comes from the brazing furnace. What is the best method of removing this?

Answer. For removing this scale (which is mainly oxide of copper), you will have to use an acid pickle. Sulphuric acid has been found the most suitable. It is used diluted and in the following proportions:

Water	9 gallons
Sulphuric Acid	1 gallon

If this pickle is used hot, it works very rapidly and we advocate its employment in this condition. While it works all right when cold, the scale is not removed as rapidly.

QUESTION No. 1154. In our burnishing process by tumbling small metal goods with steel balls, we use a neutral soap solution and it works satisfactorily with all metals except aluminum. We have only had occasion to try aluminum two or three times, but have never obtained satisfactory results. The aluminum burnishes all right but we cannot produce any lustre on

it. What kind of soap can be used for tumbling the aluminum?

Answer. Your difficulty is that all alkalies or materials that have a strong alkaline reaction act on aluminum. Caustic potash and caustic soda rapidly dissolve aluminum. Soap, while not containing enough free alkali to be particularly corrosive on aluminum, yet where it is allowed to act a considerable length of time, as it does in tumbling, causes more or less action. We recommend the use of soapbark in place of soap for the tumbling. This has a greasy nature and is not alkaline enough to attack the aluminum. It is used in tumbling small zinc articles and zinc is acted upon by alkalies in the same manner as aluminum although not as readily.

QUESTION No. 1155. Can a concrete tank be used for holding a nickel plating solution? Can it also be used for holding a brass or copper plating solution? If not, what is best?

Answer. You can use concrete tanks for any of the solutions mentioned, but they should never be used for holding more than one kind. The porous nature of the concrete renders it difficult to remove the solution from the pores in case another kind of solution is to be used. For small tanks there is no advantage in concrete and you will find wood preferable. Wood is a very satisfactory material for plating tanks, and particularly for nickel solutions.

QUESTION. No. 1156. What solution is used for depositing a verde-antique by means of the electric current? I understand that this can be done and would like to know the formula.

Answer. The following formula for producing the verde-antique by means of the electric current was published in THE BRASS WORLD, November, 1909, page 393:

Water	1 gallon
Potassium Bichromate	12 oz.
Copper Sulphate	3 oz.

The solution is used cold and with a strong current. The full 6 volts of the plating dynamo are used and more if it is had. Copper anodes are used.

QUESTION No. 1157. We desire to make a sheet metal composed of sterling-silver on one side and a soft metal, such as a solder or britannia-metal on the other. It is our idea that these two metals can be "sweated" together in the bar and then rolled down into sheet so that we will have a soft metal on one side and sterling-silver on the other. Do you think it can be produced? We want to use it for making soft metal novelties, jewelry and similar goods and it seems to us we could greatly cheapen them by using it if it could be made.

Answer. We fear you will not have much success in rolling the compound metal which you desire to make. The hardness of the sterling-silver and the soft metal is so different that we believe you will not be able to reduce the sterling any in rolling; but the soft metal will roll out leaving the sterling in almost the original thickness. You can easily try it, however, if you have a pair of rolls. Use a britannia-metal for the soft metal composed of the following:

Tin	95 lbs.
Antimony	4 lbs.
Copper	1 lb.

For a solder to connect the silver and the britannia-metal, use one composed of 2 parts of tin and 1 part of lead. The uniting of the two metals can be easily done by it. We fear you will not be successful, however, in rolling. The problem has been tried before and no one has yet done it as far as we know. Sterling-silver sheet articles, however, are filled with soft metal, but only after they have been struck up and finished. The soft metal (usually solder) is poured into the article. The object is to allow a very thin sheet of sterling-silver to be used, and have it stiffened by the soft metal backing.

QUESTION No. 1158. What can be used to brighten the copper parts of electric knife switches? These are made, as you know, from drawn copper strip, and when finished and ready for assembling, the surface is dark and tarnished. We cannot afford to buff them and presume that a dip can be used to brighten them. We notice switches on the market that evidently have been done in this manner.

Answer. You can readily dip the copper to a bright, clean and uniform color. This is the manner generally followed for brightening such work and buffing is not done except on more expensive goods. Use the following dip:

Nitric Acid	1 gallon
Sulphuric Acid	1 gallon

The copper must be first thoroughly cleaned from grease by potash or other cleaning material, and then immersed in the acid dip. The brightening takes place instantly. Then remove, rinse in cold, clean running water, to remove the acid, and next into clean, hot water. Then dry in sawdust and lacquer. After the work comes from the potash or other cleaning kettle, it should be dried, either by allowing to stand, or by running through hot water (after rinsing in cold water) and "swinging" off the surplus. If wet, the copper will not dip evenly, but will be streaked. When dry, it dips evenly.

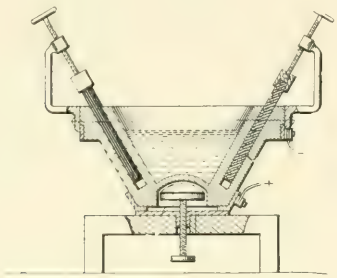
QUESTION No. 1162. What do you think of a 10% aluminum-bronze for a gear? We have some bronze gears to make and of the strongest bronze possible and we are uncertain whether to use aluminum-bronze or manganese-bronze.

Answer. You will find the 10% aluminum-bronze stronger and tougher than the manganese-bronze although much more difficult to cast. Manganese-bronze is excellent, however, and cheaper, but it is not as tough as a 10% aluminum-bronze. As far as the wearing qualities are concerned, one is as good as the other.

Patent Abstracts.

1,026,688, May 21, 1912. SAND BLAST DEVICE. Walter MacLeod of Fort Thomas, Ky., and William Hext of Cincinnati, Ohio. This sand blast is designed so that the sand is taken from the collector by suction created by compressed air, and is kept together and carried through the hose in a considerable stream. It is then ejected from the nozzle in a central condensed jet which is surrounded by a jacket of air. The object is to prevent the nozzle from being cut by the sand.

1,026,281, May 14, 1912. ELECTRIC REFINING CRUCIBLE. James Henry Reid of Newark, N. J. Assignor to the Patents Purchasing Company, of Appleton, Wis. The patent relates to an electric refining crucible and the object is to facilitate the initial heat-

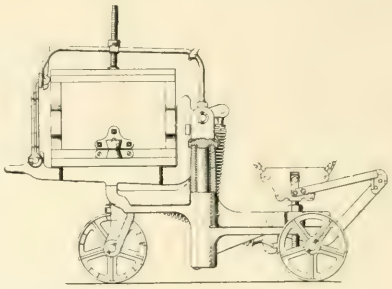


ing of the crucible and to avoid the necessity of using an excessive amount of current. This is accomplished by the use of current conducting elements in the wall of the crucible.

1,026,883, May 21, 1912. METAL POLISH. Ambrose Ridd of Newport, Ky. A metal polish composed of the following: Copal Varnish, 1 part; Turpentine, 1 part; Boiled Linseed Oil, one-twelfth part; Asphaltum, one-eighth part; Graphite, enough to give black color to the metal. The polish is intended for sheet iron or other iron or steel goods.

1,026,428, May 14, 1912. TUNGSTEN PURIFICATION. William D. Coolidge of Schenectady, N. Y. Assignor to the General Electric Co. of the same place. A method of purifying tungsten to be used for electric lamp filaments. The process is for the removal of the iron and this consists in heating the tungsten powder in a vacuum furnace at a temperature slightly below the melting point of the tungsten. The iron then volatilizes and frees itself from the tungsten.

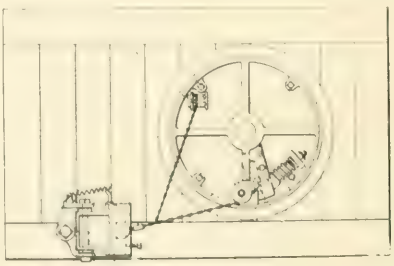
1,027,066, May 21, 1912. MOLDING MACHINE. Edward A. Pridmore of La Grange, Ill. A portable molding machine intended to be moved as desired from place to place. The flask and pattern plate are fastened to a hinged carrier to support them in an



inverted position and allow the sand to be rammed in. Suitable mechanism has been designed for withdrawing the pattern so that the mold will not be injured or there will be an unequal pressure or accidental release.

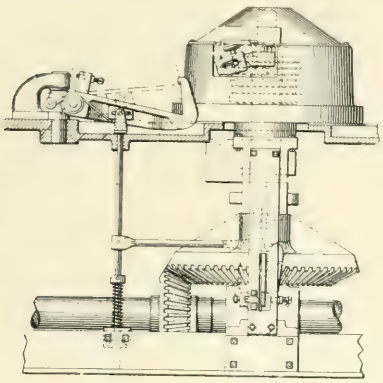
1,023,333, Apr. 16, 1912. ALLOY OF TITANIUM, COPPER AND SILICON. Auguste J. Rossi of Niagara Falls, N. Y. Assignor to the Titanium Alloys Co., of New York City. A method of making an alloy of titanium, copper and silicon. The oxides of copper, silicon and titanium are mixed with carbon and then smelted in the electric furnace. The alloy then results. This alloy is used for deoxidizing purposes.

1,026,119, May 14, 1912. WIRE-DRAWING MACHINE. John F. Pender of St. John, New Brunswick. A wire-block for drawing wire. It is so constructed that the sudden strain on the wire, due to the starting of the



block is avoided, and an even tension is exerted. Reference to the complete specification or illustration will indicate the mechanism used to bring this about.

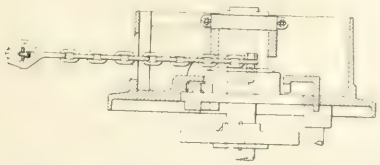
1,025,588, May 7, 1912. WIRE DRAWING MACHINE. J. H. O'Donnell and William D. Pierson of Waterbury, Conn. Assignor to the Waterbury Farrel Foundry & Machine Co., of the same city. The feature of this machine is in the method of removing the block. This is driven by friction so that it



may be taken off and another substituted without affecting the friction devices. Other improvements consist in the method of actuating the friction device when the wire has completely passed through the die or has broken.

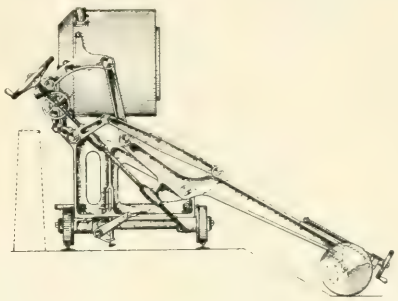
1,027,116, May 21, 1912. METHOD OF MAKING MOLDS. David M. Fahnestock of Pittsburgh, Pa. An automatic method of molding in sand. The molds are fed to the machine on a conveyor. The sand is then compressed by means of a special form of pressing apparatus conforming to contour of the mold. The mold, after being pressed, is conveyed to the floor by the conveyor which brings it to the molding machine.

1,026,840, May 21, 1912. MECHANISM FOR DRAWING WIRE. Harry E. Wheeler of Cuyahoga Falls, Ohio. Assignor to the Turner, Vaughn and Taylor Co. of the same place. The invention is on a wire block and



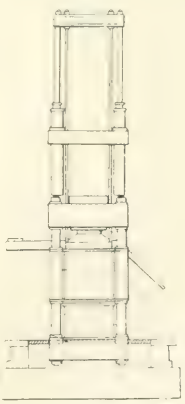
the feature of which consists in the method of constructing it so that the wire will not require gripping but once so that it can be wound upon the drum without any further operation.

1,025,515 and 1,025,563, May 7, 1912. PORTABLE FURNACE. Merrill Davis of Watertown, N. Y. Assignor to James B. Wise of the same place. A crucible furnace for melting metals and which is fired by coke, coal ,gas or oil. The essential feature



of the furnace lies in the manner of pouring. It is so designed that the metal can be poured directly into the molds. The furnace is adapted for pouring directly into iron molds used for casting brass for rolling. The tilting arrangement is the principal feature of the furnace.

1,026,987, May 21, 1912. APPARATUS FOR COMPRESSING SCRAP METAL INTO BLOCKS. Emanuel Kardos of London, England. Assignor to the London Electron Works, Ltd. of London. The press is used



for making the so-called "cabbages" of scrap metals. The feature lies in the use of a false bottom so that, when completed or finished, the "cabbage" falls out of its own weight.

1,026,700, May 21, 1912. SNAP MOLD JACKET. Edward H. Putnam of Moline, Ill. A jacket for use in encasing the sand mold which is produced by the use of snap-flask. The jacket is with the inside, which comes next to the sand, corrugated so that the gases generated when the hot metal strikes the sand, have opportunity to pass off.

Trade Items.

Conrad Dietz, 61 Clover St., Johnstown, Pa., states that he is about to start a job plating shop in that city.

The Oklahoma Plating Works is to be started in Tulsa, Oklahoma by Wm. M. French and W. T. Williams. General job plating and polishing will be carritd on. The present address is Box 133, Tulsa, Okla., and Wm. M. French is in charge.

In New Haven, Conn., an industrial exhibition of manufacturers of that city is being held and will continued for some time. Among the exhibitors is the New Era Lustre Co., the well known manufacturers of lacquers and enamels. The complete line is shown and the company has received many compliments for the exhibit which they have.

The S. A. Day Manufacturing Company, 10 Pearl St., Buffalo, N. Y., manufacturers of platers' and polishers' supplies announce that they have recently installed plating plants in the Fedders Mfg. Co., of Buffalo, N. Y., the Laudon Mfg. Co., of Fort Erie, Ont., and the Niagara Searchlight Co., of Niagara Falls, N. Y. This company manufacture compressed linen polishing wheels.

The E. Schroeder Lamp Works, 716 Jersey Ave., Jersey City, N. J., manufacturers of railway lamps and hardware, have purchased the business of the Enos Company, 7th. Ave. and 16th St., New York City, manufacturers of gas and electric fixtures. The Enos Company were one of the largest manufacturers of high grade fixtures in the United States and recently went into the hands of a receiver. The company will now go out of existence.

The Texas Company, producer of fuel oils and other petroleum products, have just issued an interesting book on "Oil Fuel." It is a treatise of some 150 pages and in it the data in regard to the successful use of oil as fuel are given. The book is illustrated with numerous reproductions from photographs. Any one interested in the use of oil for fuel will find the book of much value as it contains information, results of tests and data not found elsewhere, much of which is based on actual tests. The book is issued by the New York office, 17 Battery Place.

The Ajax Metal Company of Philadelphia, Pa., will shortly begin work on its new plant on Orthodox St., and Delaware Ave. Two buildings are to be erected, 35x240 feet for storage purposes and another for smelting. When completed the smelting portion of the business will be transferred from Richmond St., to this location. The Richmond St., plant will then be re-arranged for foundry purposes so that additional capacity will be had, and it is expected that double the capacity will then be had. The smelting of copper bearing material will be carried on at the new plant.

Murray & Sorensen, 352 Pearl St., New York City, brass founders and finishers and manufacturers of plumbers' brass goods, are shortly to move their plant to Roxbury Station, Conn.

It is reported that Frank C. Root, formerly connected with the Aluminum Castings Co., of Detroit, Mich., has acquired a tract of land in that city and will start an aluminum foundry. The site is at Grand Boulevard and St. Aubin Ave.

The Electric Smelting & Aluminum Co., of Lockport, N. Y., are sending out to the trade a folder stating facts in regard to their "Mineral Cleaner." This folder describes the properties of this material and the manner of using. The fact that this cleaner does not stain the metal and contains no fats or oils, renders it valuable to platers.

Any concern using screw machine products in steel, brass, German-silver, Tobin-bronze or other metals should correspond with Charles Nobs & Son of Newark, N. J. Estimates will cheerfully be given on small or large quantities. The facilities of this firm for manufacturing small metal goods of this kind is unsurpassed and they solicit an opportunity to quote.

The Mebane Mfg. Co., of Cleveland, Ohio, manufacturer of "Homogen", a brass flux and "Bohnite", a case-hardening flux, has now moved to its new plant in that city. The plant has been fully equipped and the company is now able to take care of the increasing business. It is stated that the capacity of the new plant is ten times greater than that of the old one.

The Bradley Rust Proofing Company, 35 Ferris St., Brooklyn, N. Y. patentees of the "Bradley" rust proofing process for iron and steel by means of which a rustless, black coating is obtained on these metals, are to install an electroplating plant at their works. This will be used for the production of special work in connection with their regular rust proofing work. This company also supply plants for applying the rust proof coating to iron and steel goods.

The installation of an efficient dust removing system is a matter that should be given attention by every manufacturer that does grinding, polishing or buffing. Not only is it necessary for the health of the employees, but it induces better work and keeps the machinery in good condition. Kirk & Blum of Cincinnati, Ohio are manufacturers of dust removing hoods for such wheels and which will be found capable of removing all the dust that may come from a wheel. These hoods are shipped anywhere on trial and are made for the largest and smallest wheels as well. The workman is not hindered or interfered with and all concerns doing polishing and buffing should investigate them.

A new machine shop, 60x180 feet, is to be built by the Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn.

H. J. Astle & Co., 118 Orange St., Providence, R. I., are sending out to the trade a booklet on the "Boland Portable Polishing Bench and Dust Collecting System" in which this machine is described.

A. Jobborn, formerly with the Precision Die Casting Company of Syracuse, N. Y., has joined the selling force of the Enterprise Metal Company of the same city and is representing them between Buffalo and Detroit. Wesley McIntyre is representing them through Eastern New York and New England.

The Reading Hardware Company of Reading, Pa., manufacturers of builders' hardware, whose plant has been idle for several months, owing to labor difficulties, has now resumed operations. Within a week or two it is expected that the plant will be run to its full capacity.

The plant of the Standard Adding Machine Co., of St. Louis, Mo., has been sold to a syndicate headed by E. A. Grant of Cleveland, Ohio. It is reported that the price paid was $100,000. The company will be reorganized and the factory newly equipped and enlarged.

The Bennett-O'Connell Co., 3600 South Morgan St., Chicago, Ill., and Cleveland office at 1111 Superior Viaduct, call attention to the fact that they manufacture a complete line of the "Excel-All" plating dynamos for every class of work. These are made from 75 to 4,000 amperes and are supplied either belt or motor driven. In addition to this line, an exceptionally complete line of plating and polishing supplies are manufactured and constantly carried in stock.

The Baltimore Tube Company has been formed in Baltimore, Md., to take over the business and plant of the Tube Bending & Polishing Machine Co., at Bayard and Carroll Sts. The manufacture of seamless brass and copper tubes will be carried on and a new condenser tube will be manufactured. A plant for drawing tubing is to be installed and a portion of the plant of the Peoples Gas Co., at Bayard St. & B. & O. R. R., has been leased. The buildings will be altered to suit the requirements.

The Hanson & Van Winkle Company of Newark N. J., manufacturers of plating and polishing supplies and equipment, have recently compiled a new catalogue which they are now sending out to the trade. This new catalogue contains 257 pages, with a large number of illustrations and is compiled in an excellent manner. The book will be found something more than a catalogue and will be found of much value to platers on account of the large amount of information it contains relative to the uses of the various materials and appliances employed in the trade. The catalogue is an excellent work of reference.

A new building, 45x120 feet is to be erected by the Cleveland Bronze & Brass Co., 4066 Hamilton Ave. It will be four stories high.

The plant of the Phoenix Hardware Company of Homer, N. Y., was destroyed by fire on May 10th., with a loss of $100,000. A new fire-proof factory will probably be built to replace it.

The name of the Buchanan-Wood Supply Co., of Cincinnati, Ohio, has been changed to the J. R. Wood Supply Co. The manufacture of grinding and polishing machinery, polishers and platers supplies will be carried on as in the past. The offices of the company are at 122 West Second St.

Lead car-seals are not used on British railroads, according to Consular Reports. The car is locked by an iron bar running the full length and much of the freight is not locked in the car at all. When valuable material, such as metals is transported, an official of the railroad usually travels in the car with it.

The Mott Sand Blast Mfg. Co., 24 South Clinton St., Chicago, Ill., manufacturers of sand-blasts, have sold a manufacturing right to the De La Vergne Machine Co., East 138th. St., New York City, the well known manufacturers of refrigerating machinery. They will have exclusive manufacturing and selling rights for the East.

The Long Mfg. Co., of Detroit, Mich., manufacturers of automobile radiators, have purchased a tract of land on Grand Boulevard in that city and will erect a new plant on it. The new building to be erected will give them double their present capacity. In order to take care of this expansion, the capital stock of the company was recently increased to $300,000 and incorporated under the laws of Michigan.

The consulting metallurgical business conducted by E. F. Lake at Bayonne, N. J., has been merged with the metallurgical business of Nixon and Raab under the name of Lake, Nixon and Raab. The office of this new company is at 156 Fairvew Ave. South Orange, N. J. Die casting machinery and the heat treatment of steel and alloys will be the specialty of the company, and physical and chemical testing will also be carried on.

A new material called "Neutrol" has been placed on the market by the William Berkel Chemical Works, 683 Communipaw Ave., Jersey City, N. J. This new material is for the purpose of neutralizing the carbonates in cyanide solutions, precipitating the carbonate as a white, insoluble solid and leaving the solution in its original condition. It is particularly recommended for use in silver and gold solutions and is the only material manufactured which can be used for this purpose. A circular has been issued by the company stating the method of using the material, and which will be sent to those interested. All platers who desire to keep their solutions in good condition, should obtain a copy.

The manufacture of gas and electric fixtures is to be carried on by the National Plating & Mfg. Co., 133 North Third St., Louisville, Ky. A plant has been started for this purpose.

The Wire & Specialty Machine Works, 1108 High St., South Bend, Ind., have recently placed on the market a new type of machine for making flexible metallic tubing. It is capable of turning out 300 feet per day.

A plant is to be built at Morgantown, W. Va., by the Model Typewriter Co., for the manufacture of typewriters. Plans are being drawn at the present time and G. E. Bruder is in charge.

The Cadillac Motor Car Co., of Detroit, Mich., manufacturers of automobiles, have purchased a large tract of land in that city on Cass Ave., upon which a new plant will be built. The capacity of the plant will then be increased.

The A. F. Flanders Co., Dearborn and Parish Sts., Buffalo, N. Y., manufacturers of window display fixtures, have purchased a building in Bridgeburg, Ont., Canada where a Canadian factory will be established. This building is situated on Courtright St.

The plant of the Schroeder Headlight Co., of Evansville, Ind., manufacturers of locomotive and other kinds of headlights, was recently damaged by fire to the extent of $27,000. The portion of the plant that was damaged will be rebuilt as soon as possible.

The Baird Machine Company of Bridgeport, Conn., desire to call attention to the trade to the advantages of the "Baird" barrel for burnishing metals by tumbling with steel balls. This barrel is made for this particular kind of work and a circular describing the advantages and method of using will be sent upon request. The Baird Machine Co., made a special study of the problem before constructing the barrel.

The Riehl Mfg. Co., 1232 East Third St., Cleveland, Ohio are manufacturers of the celebrated "Riehl Wheel" for use in polishing and plating work, as well as in other work. This wheel is made sectional and has a self-locking aluminum hub. These wheels are supplied in wire and tampico and to suit all requirements. Every variety of scratch-brush is manufactured by them. They ask that consumers try a sample lot and be convinced of the merits of these wheels.

W. S. Quigley has servered his connection with the Rockwell Furnace Co., 26 Cortlandt St., New York City, with which he has been connected since its inception, and has organized a new company called the Quigley Furnace and Foundry Co., with offices at 50 Church St., New York City. The manufacture of industrial furnaces for all requirements will be carried on and a specialty made of copper refining, dross reducing, reverberatory and other similar kinds. Mr. Quigley has associated with him able fuance engineers and the manufacturing facilities of the new company are of the highest character.

The city of Newark claims to manufacture seven-eighths of all the fine jewelry produced in the United States and contains 114 jewelry factories.

The Chemic-Alloy Co., of Bradford, Pa., which has established a branch plant in Syracuse, N. Y., are shortly to build a plant in that city. At present, leased quarters are used.

The G. B. Essex Brass Co., of Detroit, Mich., manufacturers of plumbers' brass goods, are to manufacture a line of automobile delivery wagons and are to equip a department for this purpose.

A new addition to the plant of J. Chein & Co., 310 Passaic Ave., Newark, N. J., will be made. This concern manufacture metal toys and metal novelties. The addition will cost $12,000.

Attention is called to the "Pryibil Buffers" made by P. Pryibil, 512-524 West 41st. St., New York City. These buffing appliances are made for severe use and are adapted for wide range of uses. Catalogue will be sent upon request.

The Atkinson Company of Rochester, N. Y., the well known brass founders and manufacturers of special alloys, are sending out to the trade two booklets describing the various non-ferrous castings which they make for the trade. This booklet contains much useful information. In the other booklet, the "Samson" brand of manganese-bronze which they manufacture is described.

The Bristol Company of Waterbury, Conn., manufacturers of pyrometers and recording instruments of all kinds and for a large variety of purposes, are sending out to the trade their new catalogue No. 1000 describing the "Bristol Recording Gauges." This catalogue contains sixty-three pages and in it a large list of customers are given. Illustrations and other information is contained in the catalogue.

According to the United States Geological Survey, the consumption of aluminum in the United States during the year 1911, was 46,125,000 lbs. The new aluminum plant recently built at Clarksburg, W. Va., is now in operation and is manufacturing aluminum and its compounds. All the aluminum produced is now made from Bauxite, a hydrated oxide of aluminum, and special processes are used for purifying it.

Leiman Bros., 62 K. John St., New York City, call attention to their automatic, continuous-feed sand-blasts that are adapted for all kinds of work. These sand-blasts are now in use by the leading metal manufacturers in the United States and Canada and they are made so that they cannot clog or get out of order. The large variety of finishes that can be produced by the sand blast and the cheapness of the operation particularly commends it for many kinds of products. Catalogue will gladly be sent to any one who desires it.

The laboratories of the Metallurgical Research Co., 165 Broadway, New York City, have been moved from that city to Stapleton, Staten Island, N. Y., where they are located at 27 Hudson St.

The factory of the Practical Plating Works Cincinnati, Ohio is being re-modeled and a complete new plating equipment is being installed. The location is in the Murdock Building.

H. J. Ter Doest, formerly foreman plater for the Forsyth Mfg. Co., of Buffalo, N. Y., has accepted a similar position with the Enterprise Mfg. Co., of Akron, Ohio, manufacturers of fishing tackle and fish-rods.

The S. C. Arnold Company, 571 West Van Buren St., Chicago, Ill., are sending out to the trade a new catalogue describing the line of sectional shelving and bins and tumbling barrels of special design which they manufacture.

The Elite Novelty Company have moved from Winsted, Conn., to Newark, N. J., where they are located in the Shiman-Miller Building. The manufacture of metal novelties and jewerly novelties is being carried on. Charles D. Yoos is the superintendent of the plant.

The Pennsylvania Watch Case Co., of York, Pa., has been purchased by J. R. Wood & Sons of Newark, N. J., who will move the plant to that city. It will be located in the Rosenbaum Bldg., at Broad and Aster Sts. The manufacture of gold filled watch cases will be carried on as before.

What is said to be the largest order for electric fixtures ever placed in the United States was recently given by the owners of the new Hotel McAlpin of New York City to a French manufacturer. This order totals $180,000 and includes all the chandeliers and ornaments in the hotel.

Owing to the increase in the business, the Standard Brass & Copper Tube Company of New London, Conn., manufacturers of seamless brass and copper tubing, are to erect a new building. This company, owing to the volume of business they have, are working nights.

The Whitlock Coil Pipe Co., of Elmwood, Hartford, Conn., manufacturers of a large line of brass castings, pipe coils and plumbers' brass goods, are about to commence copper plating at their plant. Heretofore, they have been doing nickel plating only, but owing to the increase in their line of goods, it has been found necessary to install equipment for copper plating.

The Pilling Brass Co., of Waterbury, Conn., manufacturers of thin gauges of brass, bronze, copper, German-silver, aluminum and zinc sheet, are to build a new mill on the Watertown Road, Waterbury, Conn. Extra stands of rolls will be installed so that the much needed capacity can be had. The new mill will be 50 x 110 feet and one story high.

The Templet Silver Co., of Westfield, Mass., has started in the manufacture of coffin hardware and other goods and will carry on silver plating.

The Wisconsin Aluminum Foundry Company has been organized in Manitowoc, Wis., with a capital stock of $3,500 by Henry Stahl, Bruno Dallwig and Abraham Schwartz.

The Pierce Arrow Motor Car Co., of Buffalo, N. Y., manufacturers of automobiles, are starting a silver plating plant at their works for the silver plating of their automobile parts.

A new vacuum cleaner is to be manufactured by the Sterling Vacuum Cleaner Co., of Worcester, Mass. Space has been taken in that city at 86 Foster St., where the cleaners will be manufactured. Frederick H. Fisher of Hartford, Conn., is the president of the company.

A new valve is to be placed on the market by the Giant Valve & Mfg. Co., of Oakland, Cal. A machine shop for manufacturing the valves is to be built at San Leandro, Cal., and later a foundry will be installed. The valve is of the high-pressure gate type. T. M. Edmonds is the president of the company.

The Wilder Metal Coating & Manufacturing Co., of Connellsville, Pa., manufacturers of aluminum alloy coated sheet steel, have under consideration the building of a new plant for manufacturing a new line of manufactured goods from their product. At present they are manufacturing only sheets.

The Pennsylvania Flexible Tubing Co., of Philadelphia, Pa., has purchased seven acres of land in that city and will build a new plant on it. This site is situated at 73rd. and Suffolk Ave. The capacity of the plant will then be increased fifty per-cent. The manufacturer of brass and steel flexible tubing is carried on.

The Brown Instrument Co., of Philadelphia, Pa., the oldest manufacturers of pyrometers in the United States, are sending out to the trade their new catalogue of 55 pages in which the extensive line of pyrometers and accessories which they manufacture are listed.. This catalogue is compiled in an excellent manner and illustrated with many reproductions. It also contains a list of users of the Brown instruments. This company started in the manufacture of pyrometers in 1860.

Obituary.

Seth Catlin, the well known inventor of the Nonesuch electroplating machine and other plating devices, died at his residence in Bloomfield, N. J., on June 4th. Mr. Catlin was for many years plater for the Consolidated Safety Pin Co., of that city and was a man of large experience in electroplating. Mr. Catlin was over seventy years of age and had been connected with the plating industry for nearly fifty years.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.22
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia, 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.08
Arsenic, Metallic	lb.	.10
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.50
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitrol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.10
Chrome-Green	lb.	.50
Copper, Lake (carload)	lb.	.17⅛
Copper, Lake, (cask)	lb.	.17⅜
Copper, Electrolytic, (carload)	lb.	.17
Copper, Electrolytic, (cask)	lb.	.17¼
Copper, Casting, (carload)	lb.	.16⅞
Copper, Casting, (cask)	lb.	.17⅛
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Flour Spar	lb.	.01¼
Fuel Oil	gal.	3.50
Gold Chloride	oz.	11.75
Gold, Pure	oz.	20.87
Gum Copal	lb.	.30
Gum Guaicum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iridium	oz.	62.50
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04¼
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	1.16
Mercury, Metallic (Quicksilver)	lb.	.41
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.40
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Satpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Cloride	oz.	23.00
Platinum Metallic	oz.	45.50
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic (Potassium Hydrate)	lb.	.08
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.08
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.60⅞
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin Metallic	lb.	.45⅞
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc, Carbonate, dry	lb.	.19
Zinc, Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.07

THE BRASS WORLD AND PLATERS' GUIDE

VOL. VIII. BRIDGEPORT, CONN., JULY, 1912. No. 7.

A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.

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Contents for July.

Aluminum, Process for Soldering 252
Aluminum, "Kink" in Grinding 247
Automobile Hardware, Silver Plated 230
Automobiles, Brass Specifications for 234
Brass, Right Method of Melting 229
Brass Beds, Refinishing Old 243
Brass Foundry Mixtures, Standard 239
Brass Deposits by Soft Metals, Absorption of..... 243
Brass and Bronze Plating Solutions 244
Brush-Brass Finish, Production of the 235
Burnisher, The "Rotary" Ball 245
Composite Sheet Metals, The "Hoyt" 248
Core Oils in French Foundries 253
Crucible Furnace, Improved 256
Crucible Cover, Improved 254
Files, Circular 251
Flux for Tinning, New 254
Galvanizing, Novel Process of 257
Grinding, Brass, Bronze and Aluminum 236
Magnesium, Calcium for Deoxidizing 242
Manganese Bronze, Use of Chills on 241
Nickel vs. Copper in French Coinage 234
Nickel Plating Solution, New 250
Nickel Plating Solutions, Use of Wood Pulp in.... 251
Ormolu Goods, Silvering before Brass Plating 238
Platinum, Direct Determination of 248
Plating Barrels, New Forms of 257
"Prometheus", the New Nickel Plating Bath 250
Rammers, Power Hand 253
Sodium, Danger in Transporting 246
Steel Material, Rust-Proofing Large 247
Steel Rolls for Cold Rolling 252
Trisalytes, The 246
Wetherill Casting Apparatus, Pneumatic 255

The Right Method of Melting Brass or Composition.

We recently received a letter from a brass founder as follows:

"In melting a mix of metals, is it proper to melt the copper and gates together and then add the tin, zinc and lead, or should the copper be brought to the right heat and the tin, lead and zinc then added, and finally the gates?"

This question brings to our mind the fact that the right method of melting is not generally understood. To be sure, brass or composition may be melted in several ways, but there is one way that is best and the other methods do not give as good results.

The best method of melting is as follows: In the crucible with the copper place some of the gates or scrap to be used. A considerable quantity may be used, if they can be put into the crucible, and the quantity may reach twenty-five per cent. of the weight of the copper if desired. The copper and gates are then covered with charcoal and the whole melted.

The advantage in the use of scrap or gates in the crucible with the copper is that, melting first as it does, it forms a bath of molten metal in the bottom of the crucible into which the copper can flow as it melts and runs down. The gates or scrap thus melted in the bottom of the crucible, contain zinc, of course, and this acts as a deoxidizing material immediately when the copper strikes it. In addition to this, the presence of the molten scrap causes the copper to melt at a lower temperature. It will be found that the copper will melt in less

time when scrap is put into the crucible with it than when melted alone.

After the copper has melted, the whole is stirred and the spelter is then introduced, after which the metal is stirred again and the tin and lead added. It really makes no difference whether one is added before the other, except that it is good policy to add the spelter as soon as the copper and scrap have melted and arrived at the right heat. The metal is then at the right heat for its introduction, otherwise it would make no difference when it was added. The effect is the same whether added before or after the tin and zinc.

The method of melting, therefore, is as follows:

1. Melt the copper with gates or scrap.
2. Add the spelter when these have melted.
3. Then add the tin.
4. And finally the lead.

The principal feature is in the use of gates or scrap with the copper. After these have been melted and after the spelter has been introduced, more scrap can be used before the tin and lead have been added.

Silver Plated Hardware the Tendency in Automobile Work.

The value of silver plated lamps and automobile hardware was mentioned in THE BRASS WORLD some time ago and it is pleasing to note that some of the leading automobile manufacturers have realized that silver plating is superior to nickel plate for this class of work. A number of manufacturers are to use it next year quite extensively for their work.

The tendency in automobile manufacture is toward white hardware and the coming year will witness nearly all cars equipped with nickel plated lamps and hardware. It is noteworthy that these manufacturers are profiting by experience and the manufacture of automobiles is undergoing the same transition that took place in the making of fine coaches. If a coach manufacturer should attempt to put brass or even nickel plated hardware on his goods, he would find it impossible to sell them, and the automobile manufacturer seems to have the same problem before him although it has not yet arrived at as marked a degree. One maker of automobile and carriage hardware recently said that it seemed to him it was only a short time hence when the automobile trade would call for close-plated silver hardware as the fine grades of carriages and coaches now have as their equipment.

The advantages of silver really need no explanation. It has a color that at once distinguishes it. It takes a high polish and above all, for automobile work, it does not corrode like brass or even nickel. It tarnishes to be sure, but this is only superficial and is very easily removed. The cleaning of silver is far easier than any other metal that could be used. Nickel does not tarnish readily but after a time it becomes coated with a film of oxide that is removed only with difficulty. Again, nickel is more apt to peel and when it is cut through, as it often is by constant polishing, it has to be stripped before it can again be plated. Silver does not peel and can be plated over without stripping if necessary. In addition, nickel does not have the white color of silver.

Silver is not such a costly metal, and the labor of plating it is no more than that of nickel. The amount of silver put on automobile goods need not be so great as to increase the expense to any material amount.

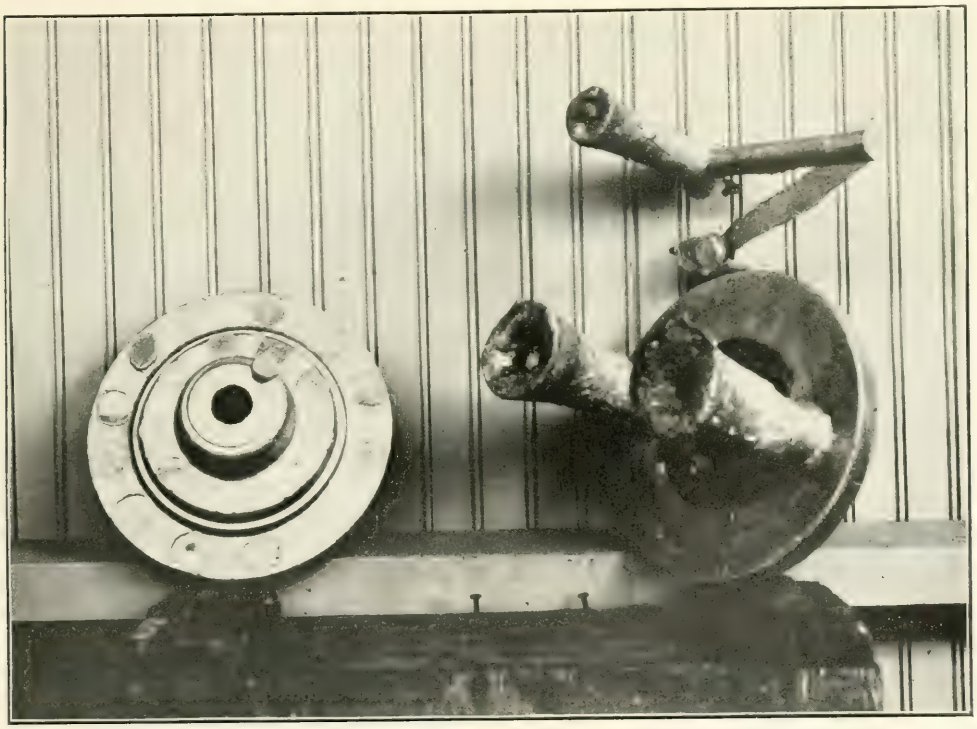
It is believed the silver plating era in automobile manufacture has arrived and will tend to beautify the car as well as decrease the labor required to care for it.

It has been proposed to use metallic tantalum for standard weights. Tantalum resists all acids except hydrofluoric and seems to answer all requirements of permanence in the air. It is cheaper than platinum. The cost is stated to be only one-third of the hard platinum now employed.

The use of aluminum in making yellow brass sand castings is now very extensive and its employment has worked wonders in the brass foundry trade. It produces sounder castings, causes the metal to run more freely and produces a better surface on the casting. When aluminum is used, it is possible to put a very much larger number of pieces on a gate of patterns, and also, in the majority of instances, to pour the flask "flat." A small quantity of aluminum only is necessary, a few ounces to 100 lbs. of brass, are always sufficient, and even less will answer.

Use of Chills in Making Manganese-Bronze and Other Strong Bronze Sand Castings.

While chills have long been used in the casting of iron, they have not been as extensively employed in the casting of the non-ferrous metals as they should. In the brass foundry dealing with ordinary brass and composition, chills are never used for the reason that they are never needed. It was only with the advent of the strong bronzes that the use of chills began, and then only after some time. The rapid increase in the demand for large aluminum castings and ones quite complicated, also created a demand for chills and they are now used to a considerable extent in aluminum foundries where they have been found a great help.



Vanadium-Bronze Sand Castings Showing Method of Placing Risers, Gating and Using the Chills.

In the casting of manganese-bronze and similar strong bronzes which shrink more than ordinary brass or bronze, chills will be found of much service as not only may they often be used in place of risers but also may be employed as an adjunct to them or in conjunction with them as shown in the illustration.

There are several laws which molten metal obeys in cooling and in the case of manganese-bronze, as well as other metals, the lightest portions of the castings begin to solidify first. These, in turn, as they cool, draw from the heavy portions, the last to cool. The heavy portions, being the last to cool, form a solidified skin over the surface and while the interior is still liquid. Therefore, there is no other way for the metal to shrink or contract except to form a cavity in the center. This fact explains why it is possible to make manganese-bronze castings of good appearance, without the use of any risers at all, but when the heavy portions of the castings are cut open, a cavity of greater or less size will invariably be found. This takes place on account of the fact that the heavy portions have nothing to draw from and, therefore, "draw from themselves." This fact has been demonstrated again and again to such an extent that no founder who has had any experience with

manganese-bronze would ever attempt to make a casting without a riser or heavy gate, which answers the same purpose in the case of small castings.

As previously stated, heavy portions of the casting are the last to cool, and unless they have something to draw from, in the way of liquid metal, a cavity will be formed in them. In order to guard against this, it is customary to place risers on these heavy portions. The risers, being heavy (unless fed with hot metal, they should be heavier than the casting), and cooling before them, draw the necessary quantity of liquid metal from them and become solid in cooling. In other words, the riser, being the last to cool takes the shrinkage.

It frequently happens (and many brass founders are already familiar with such a condition), that, when the riser is cut off, a shrink-hole is found at its base, penetrating the casting to considerable depth and ruining it. The cause of this difficulty is that the riser is not sufficiently large. It cools before the casting, and draws from it, leaving the cavity when cooled, instead of the casting drawing from the riser. Risers are always troublesome to cut off, but there is never anything to be gained by the use of risers too small. One might as well not use any at all. It is far better to err on the side of placing a riser on the casting that is too heavy, rather than to use one that is too light. A heavy riser can do no harm, except to take more metal, and this is not a serious matter; but a riser too small will invariably ruin a casting.

The value of chills in casting manganese-bronze lies in the fact that when the molten metal comes in contact with them, it chills and solidifies the metal at this particular point and causes the shrinkage to take place as desired. In other words, chills render the cooling of the casting more or less flexible so that it can be controlled as desired.

In the casting of manganese-bronze herewith shown, chills had been used in making it. The top and bottom sides are shown and on the bottom the chills were employed. The portions of the casting coming in contact with them may be seen as round spots.

The chills used may be of any metal, but copper or bronze is preferable on account of its high melting point (higher than that of the manganese-bronze) and high conductivity for heat. Brass may be used, but unless the chills are heavy they do not stand as well as copper or bronze. If too small, they become hot as soon as the metal strikes them, either melting them or heating them so hot that they do not chill the metal. If too large, they chill the metal too rapidly so that it will not fill the mold well. In the illustration herewith shown the chills were small, round pieces of brass inserted in the drag portion of the mold.

The chills placed in the mold as indicated in the illustration, cooled the casting at the bottom within a short time after the metal had been poured. The cooling then took place gradually beginning at the bottom and the top, upon which the risers were situated was the last to cool. This is the logical manner and one that is conducive to the best results.

The casting herewith shown was not a large one and its diameter was less than a foot so that it would naturally seem that with such a comparatively small casting, chills and risers would hardly be necessary. The experience of the maker, however, was such that this method of casting was found the most satisfactory and the castings were invariably sound. It was rare indeed that imperfect ones were found and the risers and chills always took care of the shrinkage.

The method of gating should also be noted. A horn sprue was used, connecting the hub on the drag side of the pattern. The zig-zag shaped runner was also used to prevent dross from entering the casting. It is a well established fact that a long runner is conducive to good work in making manganese-bronze castings. The dross, which always forms in pouring, on account of the aluminum in the manganese-bronze mixture, will enter the casting if the runner is short but if a long runner is used, it will usually remain in it, particularly if the metal is poured easily and not forced.

The casting herewith shown was made at the foundry of the Vanadium Metals Co., Groton, Conn., and the method of casting was devised by L. D. Beitzel, the foundry foreman of the company, who has had long experience with the strong bronzes and it may be said that his method of casting this piece is the result of his long familiarity with this class of work. The method resulted in obtaining a very large percentage of good castings and one was rarely lost.

Yellow brass screw rod chips are now the chief raw material for the manufacture of yellow brass ingot.

Refinishing Old Brass Bedsteads.

The extensive use, within the past ten years, of brass bedsteads has been instrumental in causing a certain proportion of them to find their way into the job plating shop for re-finishing. It is a business that should be quite profitable for such establishments, but there are many platers who are not familiar with the method of re-finishing them and make a hard job of it. One in particular, made hard work of it and first removed the old lacquer by means of potash with the result that the potash worked into the seams of the tubing and soon spotted out. He stated that no matter how he did it, the spotting out would occur.

Brass beadsteads are never made of solid brass tubing, but of steel tubing covered with sheet brass. Sometimes, in the cheap grades of bedsteads, this seam is not brazed, but in the best kinds it is. The potash, which the aforesaid plater used, worked into the seams while the cleaning was going on and was not removed in rinsing. In fact, it is very difficult to remove it and any cleaning compound would act in the same manner.

There is but one satisfactory method of refinishing a brass bedstead and that is to start right in and "take the bull by the horns" and remove the lacquer on a wheel. Old brass work that has been lacquered is usually badly fly-specked and these specks penetrate the brass to a considerable distance. Even were the lacquer removed by potash the surface of the brass would reqnire cutting down and this can just as well be done right away as to remove the lacquer first.

The method of procedure is as follows: Take the bedstead apart as much as possible. This is not a difficult job as the pieces are put together by screw joints. Then start right in to cut down the surface, removing the old lacquer at the same time. A tampico wheel is used and emery paste or cake is the material employed on it. It will surprise one how rapidly this will cut the surface and it will be found much better than tripoli as it cuts faster. There may be some places that the wheel cannot reach, and if this is the case, then these may be reached by a stiff, bristle brush and the emery cake. In a short time the old lacquer will have been removed and the fly-specks as well, with a good surface left for further finishing.

There are now two methods of procedure followed, depending upon whether the final finish is to be buffed bright or left with the brush-brass finish. If to be buffed bright, then clean off the emery paste from the surface and buff with rouge to the desired "color", wipe off and lacquer.

If the "brush-brass" finish is desired, then the emery paste may be used directly after cutting down as this is a good material for producing it. After cutting down, it will be found that the surface is full of small scratches, and all that it is necessary to do is to make these longitudinal or with the tubing and the whole is finished. A hand brush is necessary for some of the work and by a combination of the two, the desired "brush-brass" finish can be produced.

The surface is now cleaned off and the grease removed by rubbing with gasoline or lacquer thinner (the thinner is better) and the surface is ready for lacquering.

The method avoids the use of potash or any cleaning solution as this is apt to cause spotting out. In fact, with cheap bedsteads it always does. As previously mentioned, by "taking the bull by the horns" and cutting oft lacquer, fly-specks, scratches etc., right away, the use of any cleaning solution is obviated. The results will not only be good, but much time is saved. By the use of such a method the re-finishing of old brass bedsteads is not a difficult job and job platers will find it a good source of income and a business that is constantly growing. The constantly increasing use of brass bedsteads cannot but bring a corresponding quantity to the job shop for re-finishing.

Fusel-oil, as employed in the manufacture of lacquers, is not any definite chemical compound, but consists of a number of substances. It is not manufactured directly, but is a by-product in making alcohol. Ordinarily, fusel-oil is composed of a mixture of amyl-alcohol, propyl-alcohol, furfurol, organic esters etc. The amyl-alcohol is the principal ingredient and the smell of fusel-oil is usually due to it. Amyl-acetate, so necessary in the making of lacquers as a solvent for the pyroxylin (soluble cotton), is made from fusel-oil, and so far there has been no other process of producing it in a commercial manner.

Sheet and Rod Brass Specifications of the "Society of Automobile Engineers."

New specifications were recently compiled by the Society of Automobile Engineers for sheet and rod brass to be used in the construction of automobiles. The specifications drawn up are as follows:

SPECIFICATION No. 33

Standard Sheet Brass for Use in the Manufacture of Lamps, Horns, Flexible Tubes, and Ornamental Work in General. — Tensile strength, hard, about 60,000 lb. per square inch; elongation, about 5 per cent. in 2 in. Tensile strength, soft, about 48,000 lb per square inch; elongation, about 50 per cent. in 2 in. Drawing brass and spinning brass are special qualities of brass for the operations indicated by the name.

SPECIFICATION No. 34

Low Brass—Used on account of color, resistance to corrosion and atmospheric conditions, and on account of superior ductility. Tensile strength, hard, about 75,000 lb. per square inch; elongation, about 5 per cent. in 2 in. Tensile strength, soft, about 42,000 lb. per square inch; elongation, about 50 per cent. in 2 in.

SPECIFICATION No. 35

Brazing Brass—Used for parts where brazing or silver soldering is required. This material has about the same physical properties as low brass.

SPECIFICATION No. 36

Free-cutting Brass—Used for small parts to be milled or turned; also for brass plates which must be sawed to shape. It has a tensile strength when hard of about 75,000 lb. per square inch, with an elongation of about 3 per cent. in 2 in. When soft, its tensile strength is about 50,000 lb. per square inch, with an elongation of about 35 per cent. in 2 in.

SPECIFICATION No. 37

Red Metal, Commercial Bronze—Has a rich gold color and is used for screen wires, radiators and in other places subject to corrosion. It is also used for ornamental parts where its color is desired. Its tensile strength, hard, is about 55,000 lb. per square inch, with an elongation of about 5 per cent. in 2 in. Soft, it has a tensile strength of about 37,000 lb. per square inch, and an elongation of about 40 per cent. in 2 in.

Gilding Metal—This material is used for radiators. It has a tensile strength of about 45,000 to 55,000 lb. per square inch, with an elongation of about 5 per cent. in 2 in. when hard. Annealed soft its tensile strength is about 35,000 lb. per square inch, with an elongation of about 35 per cent. in 2 in.

SPECIEICATION No. 39

Brass Rod for Cold Heading—Has a tensile strength of about 35,000 to 40,000 lb. per square in, with an elongation of about 50 per cent. in 2 in.

SPECIFICATION No. 40

Free-Cutting Brass Rod—This material is suitable for automatic screw-machine work. Its tensile strength is about 65,000 lb. per square inch, with about 15 per cent. elongation in 2 in.

Nickel vs. Copper in French Coinage.

M. Klotz, Minister of Finance, submitted at the last meeting of the Cabinet a proposal to substitute smaller perforated nickel coins for the present copper pieces of 5 and 10 centimes (100 centimes=19.3 cents) which resemble the British halfpenny and penny pieces. The proposal, which will be tabled to-day in the Chamber of Deputies, contemplates the issue of 80,000,000 francs of the new perforated coinage in pieces of 5, 10 and 25 centimes. Nickel pieces of 25 centimes are already in circulation, but they are not perforated. The object of perforation is to make the new nickel coins distinguishable by the feel from coins of similar size in silver.

If Parliament adopts the Government proposals the value of the copper coin which will be withdrawn from circulation is estimated at 59,000,000 francs. The copper would be used for the future coinage of centimes—the smallest French coin—for colonial coinage, and for the execution of various orders for coins received from abroad.—*Daily Consular Report.*

According to an English patent, a superior soft solder may be obtained by melting together 6 parts of tin, 6 parts of lead and 1 part of bismuth. The solder melts much lower than ordinary soft solder

The Production of the "Brush-Brass" Finish.

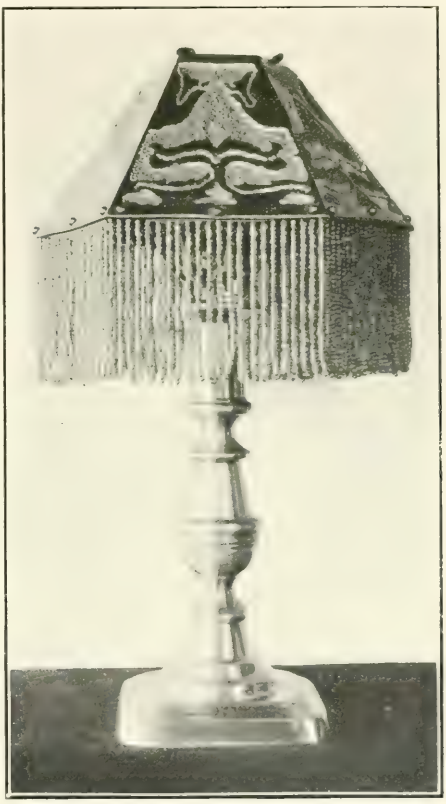
The "brush-brass" finish has now become one of the most popular finishes on the market and is extensively used, both upon solid brass and brass plated soft-metal goods. When well done and lacquered with a suitable lacquer, it is an extremely pleasing finish and it will probably be a long time before it ceases to be popular. It is a simple finish to produce, but many platers are apt to make hard work of it and even with a large amount of labor are unable to obtain quite satisfactory results.

The method of producing the "brush-brass" finish is the same for plated or cast brass, although perhaps a little modification may be required for special patterns or designs. Strictly speaking, the finish is simply the production of innumerable fine scratches upon the surface, all running in the same direction. If these scratches are not uniform and some are deeper than others, then the effect is not good. If they do not run in the same direction, the job will appear "botchy"; and if they are too coarse, the effect is not satisfactory. The whole thing in a "nut-shell", therefore, is to scratch the surface by any convenient means.

The production of the fine scratches upon the surface of the brass work may be accomplished in several different ways. One of the early methods was by the use of emery paste and a bristle or tampico wheel. This produces good results, to be sure, but it leaves the surface greasy and cleaning is then necessary which is apt to stain the surface to some extent. The grease in emery paste is hard to remove as it contains mineral oils so that this method is not to be recommended unless absolutely necessary.

Another method is to use a rapidly revolving steel scratch brush, but this produces a satin-finish effect with a lustre that is undesirable. Various types of abrasives and wheels have been tried but the most satisfactory method has been found to be the use of pumice ground to a suitable fineness and used wet upon a brass scratch-brush revolving slowly. The use of oil or grease in producing the finish is not to be recommended as it necessitates subsequent cleaning with its extra cost and dangers of abrading or staining the surface.

The grade of ground pumice to be used will depend upon the character of the work. Some manufacturers prefer a finish that is quite "scratchy" while other desire one that shows the scratches to a very slight effect. The different effects can readily be obtained by varying the grade of pumice. The grade ordinarily used, however, for the production of a good "brush-brass" finish is No. .0½.



Cast Brass Article Illustrating Application of the "Brush-Brass" Finish.

In producing a satisfactory "brush-brass" finish, the first thing to do is to obtain a surface on the article. The matter is exactly the same as though the article is to be buffed to a high "color". Every plater knows that it is useless to buff a piece of brass until all the scratches, dents and pits have been taken out. In other words, the brass must be surfaced, at least, and brought almost to a "color". The object is to obtain a base for producing the "brush-brass" finish so that there will be no

scratches in it deeper than those desired. This instruction, however, applies only to solid brass work as plated work is usually ready for applying the finish after it has been plated.

When the brass has been surfaced and brought to a condition that is free from scratches, the "brush-brass" finish may be applied. Use a small scratch-brush running rather slow, say about 300 revolutions per minute. Apply the pumice and water to the wheel and hold the work against the wheel until the desired effect has been produced. The successful production of the finish lies partially in having the scratch marks run evenly and in the same direction. They should run lengthwise of the article, as a general rule and the best effect will be obtained when such is the case.

When the article has been finished by the treatment with the pumice and scratch-brush, it is ready for lacquering. The fact that nothing but water (and no oil or grease) has been used, renders it easy to lacquer the article. All that is necessary to do is to wash it off, dry and lacquer in the regular manner. If, however, a large number of pieces are carried through at a time, considerable time may elapse before the lacquering can be done; and when such is the case, it frequently happens that the surface becomes stained or slightly tarnished before it can be lacquered. This can usually be removed by a muriatic acid dip, or if not by a cyanide dip. The muriatic acid is to be recommended as it does not cause spotting-out, while cyanide frequently will The muriatic acid will usually remove any slight stain. Use the following:

Water	2 gallons
Muriatic Acid	1 gallon

If, however, this does not remove the stain, then use 1lb. of cyanide dissolved in 1 gallon of water. This, however, is more apt to cause spotting-out by entering the pores or joints of the article and afterwards working out. For this reason, the muriatic acid is to be preferred whenever it is possible to use it.

Care must be used in rinsing and drying the article after finishing to avoid abrasion or staining. Then apply a coat of suitable lacquer. Lacquer manufacturers now make a special grade of lacquer for this class of work and when used it will produce the best effect The use of a lacquer not adapted for the work may ruin what is otherwise a good job

Grinding Brass, Bronze, Aluminum and Other Non-Ferrous Alloys.

The grinding of the non-ferrous metals and alloys is a subject that has seldom been treated in publications and any information pertaining to it is always of interest. George W. Thompson of the Norton Company of Worcester, Mass., the well known manufacturers of abrasives, recently read a paper on the grinding of brass, bronze, aluminum and other alloys, before the 1912 sales conference of this company. This paper contained the following:

To develop a wheel that will successfully grind brass, bronze, aluminum and other alloys is one of the most difficult problems that grinding-wheel manufacturers have endeavored to solve. Greater success has been obtained in grinding these since the development of modern electric-furnace abrasive materials.

Grinding Brasses and Bronzes

Brass and bronze were forerunners of all casting alloys. It is now necessary, however, to distinguish between numerous kinds of brass of high and low zinc content, red and yellow, bronze, naval brass, malleable brass, aluminum brass and many others. The term "bronze" was formerly employed to indicate an alloy, the only constituents being copper and tin—copper predominating; but in recent years almost every combination of metals possessing strength and toughness may be described as bronzes.

In trade circles, brass is generally understood to mean an alloy of two-thirds copper and one-third zinc, but in every-day foundry practice it is found to contain other metals besides copper and zinc. The copper content may vary from 60 to 88 per cent. of the whole mixture; likewise the amount of copper and tin in bronze varies.

While very desirable qualities for mechanical purposes are obtained by the alloying of zinc, tin, lead, iron, manganese and nickel to copper, with but two exceptions the resulting alloys show very little difference in their action on a grinding wheel of the correct grain and grade. The exceptions are nickel bronze and bell metal—two of the hardest alloys. These can be ground with fair success on the same wheel as the other alloys, but where the quantity of this material coming through will

warrant it, it is recommended that a special grade be used.

The content of nickel in nickel bronze and tin in bell metal is sufficient to make them very hard. On nickel bronze, a wheel made of Crystolon, grain 24, grade Q gives very good results; and for bell metal, a wheel made of the same material but of a little harder grade. Nos. 24 and 30, grade R wheels are recommended. Comparatively thin wheels are, as a rule, used on bell metal work and the corners are used to quite an extent. The work is, therefore, severe on the grinding wheel.

An experience in grinding brasses, and bronzes with two Crystolon wheels will be of interest. A 14 x 2-inch 24-Q and 14 x 2-inch 30-P were placed on the same arbor in one of the largest commercial foundries in Connecticut and used ten hours a day every day in the week except Sunday on all shapes and kinds of brasses and bronzes. These wheels were watched very carefully—almost daily—and no noticeable wear of the surface could be found for several days. They have been running eight months and at this writing measure 12½ inches diameter. The dresser has not been used on either wheel during this time. The 30-P seems to be working a little better; the 24-Q not working quite as free and clean.

ALUMINUM.

This alloy is ductile, malleable and tenacious. In the automobile industry, where light castings are important, alloys containing aluminum and zinc are largely used. In this class of work Crystolon elastic wheels grain 36, grade 4, have been giving very satisfactory service. This wheel has shown best results from tests conducted in the Department of Tests on automobile parts such as lower part of crank case, crank case cover, transmission case, upper and lower float chamber and exhaust pipe. This wheel was found to remove the metal faster and load the slowest of all wheels tried, and at the same time gave a good surface. Grade 5 elastic process has also shown some good work.

NICKEL BRONZE.

When experimenting on this alloy, the same wheels were used that were tried on the brass, standard bronze and aluminum. A feature to be noted, on account of its usual absence in connection with grinding brasses and bronzes, was the formation of very dull red sparks which were quite dense just under the point of contact. These sparks became invisible at approximately 4 inches from point of contact. All wheels heated the work very quickly and felt "hard;" in fact, this bronze appeared much harder than any of the other brasses or bronzes. The wheels all loaded about equally. The 24-Q and 30-P wheels were the best cutting wheels, perhaps, the 30-P doing the better work although both were about equal.

GOVERNMENT BRONZE.

This alloy also gave off a very dull, red spark, but was not as noticeable as in the case of nickel bronze. The 30-P was the best wheel as it took hold well, did not load half as much as the 24-Q, although used more, nor did it feel as hard as did the 30-Q and 36-P. A characteristic of these wheels was that the alloy loaded the wheels in small spots less than the size of a pin-head. In regard to the loading of wheels, experiments showed that aluminum loads more than the other alloys referred to in this article; phosphor-bronze next, standard foundry bronze and government bronze about the same, and nickel bronze the least. All wheels tried were 14 x 1½ x 1½ inches and run at 1,360 revolutions per minute or 5,000 surface feet a minute.

A 30-P Crystolon wheel is recommended for the snagging of all kinds of brasses and bronzes in ordinary commercial foundries. This does not apply, of course, to foundries that melt up one kind for a special purpose. In cases of this kind, it would undoubtedly be policy to test out—say 24-P, 24-Q, 30-P and 36-O Crystolon to determine which is best adapted for the work.

Mr. Thomson supplemented his paper with samples of castings of the various alloys, which samples had been given a thorough test in the company's Department of Tests for the purpose of deciding on a grain and grade of wheel, and the kind of abrasive material that would grind them most efficiently.

The use of cadmium in silver solders is of advantage in that it lowers their melting point considerably and causes them to flow freely at a less heat.

German-silver wire is unsatisfactory for use in rheostats employed in electroplating. The fumes of the plating room, sooner or later cause it to crystallize and break.

Silver Plating Ormolu Goods Before Gilding.

Large quantities of ormolu gold goods in the shape of clocks, jewel-boxes, trays, candlesticks, etc., are now sold. They are made of either antimonial-lead or zinc and then plated. The method of plating is as follows:

The casting, constituting the article to be treated, is cleaned in the usual manner and then run through a hot copper solution to completely cover the surface. A hot cyanide copper is used for this purpose and as weak a current as possible is employed in order to avoid blistering. All that is necessary is to completely cover the surface. After this has been done, the article is then transferred to an acid copper solution and a heavy copper deposit put on. From 1 to 1½ hours are consumed in this operation in order to obtain a sufficiently heavy copper deposit, as a light one will not produce that matt surface necessary for the ormolu effect. The production of the necessary dead effect, and to allow the acid copper deposit to "throw" into the deep pockets of the article, consume from 1 to 1½ hours. If, however, there are deep pockets or portions of the article which the acid copper will not "throw" into (and this is frequently the case), then a heavier cyanide copper deposit will have to be used, as the copper from a cyanide solution will throw where an acid copper will not.

When the acid copper deposit has been completed, the next operation can be carried out directly, but in regular practice, it is usually necessary to allow the articles to remain, in order to economize on labor as much as possible. For this reason the surface is usually more or less tarnished and stained. In order to avoid this, it is customary to run the article, after it comes from the acid copper solution and has been standing for some time, through a bright acid dip composed of sulphuric and nitric acids. This serves to produce an even, bright surface on the copper and after rinsing the article is ready for the next operation.

If the article is now gold plated directly upon the copper, the red color of the copper underneath becomes paramount, and instead of the true gold color, so much desired and admired, the gold has a reddish shade. This, of courses, can be overcome by a heavy gold deposit, but then the expense of gold is such that the goods cannot be sold. The object is to use as little gold as possible.

In order to accomplish this economical use of gold, and still have the desired shade, it is customary to give the copper a light deposit of yellow before gilding. In this manner the color of the gold is not changed to any extent, for the reason that the brass is of nearly the same color as the gold. After the brass has been deposited, the gold is put on, the article rinsed, dried and then lacquered when it is completed. So much for the *regular* process of producing the ormolu finish. Whenever possible, this is recommended as it produces the best results.

There are many platers who have poor success in running a brass solution, and it was recently found that one of them, who was manufacturing soft metal novelties with the ormolu finish, was unable to obtain a satisfactory brass deposit, so in order to avoid the red color given the gold by the copper when deposited directly upon it, used silver instead of the brass and then deposited the gold directly upon the silver. The white color of the silver apparently does not change the color of the gold to the extent that copper does, and contrary to what one would expect, the gold deposit is not bad at all.

While this process is really a makeshift, it may be found satisfactory in some instances and the reader can take it for what it is worth.

The modification, therefore, consists in silver plating the copper previous to gilding instead of brass plating as customarily followed.

Scratches or cracks cannot be covered by an electrodeposit, but will show after the deposit has been put on. The deposit follows the contour of the metal.

According to a United States patent issued to Milton H. Campbell on January 31, 1882, silver and platinum may be deposited together. He recommends an alloy of 30 parts of platinum and 70 parts of silver. This alloy is dissolved in aqua-regia and "precipitated as a gray powder by sal-ammoniac." This is dissolved in potassium cyanide in the regular manner of making up a silver plating solution. For an anode, the same proportion of metals is used. A weak current is employed for the electrodeposition. It is stated that the deposit thus produced will stand the action of nitric acid, and is not tarnished by sulphides.

Standard Brass Foundry Mixtures and Method of Making Them.

By Erwin S. Sperry.

(Continued from page 204, June, 1912)

Yellow Brass Mixtures

Yellow brass mixtures are used in brass foundry work for two reasons:

1. They are cheaper than the red mixtures.
2. They have a true brass color.

The fact that the yellow brasses are cheaper than the red ones is responsible for their extensive use. While yellow brass is now extensively used for ornamental work, the cheapness is the main reason for its wide employment.

As a usual rule, brass founders do not like to cast yellow brass, and prefer to make com-

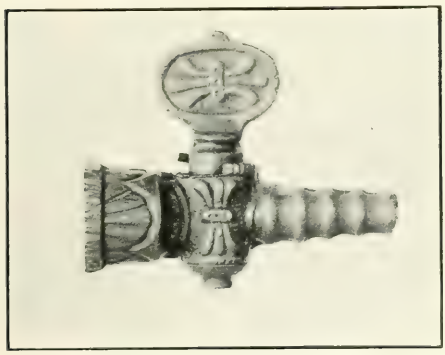


Fig. 1. Article Illustrating Yellow Brass Mixture for Gas Cocks.

position castings. Go to a brass founder with a pattern to be cast in brass and ask him which he would recommend, and he will tell you in ninety nine cases out of a hundred that composition is the best for your purpose. He knows that he can always obtain a good clean casting of composition, while with yellow brass, he is apt to have dirty, drossy castings that will have a bad appearance. Yellow brass is much inferior to composition as a casting mixture, on account of the large amount of zinc it contains. The use of aluminum, however, has changed this condition somewhat and castings of yellow brass can now be made, by the addition of a little aluminum, which would never be attempted without it.

Use of Aluminum.

Aluminum has worked wonders in the making of yellow brass castings. Before its value was known, or before aluminum was anything but a curiosity, yellow brass was far less extensively used than at the present time on account of the difficulty of making clean castings. Even then the amount of zinc in the yellow brass mixture had to be kept as low as possible to avoid dirty castings. Some classes of work could not be made at all and no brass founder would ever have thought of using as much zinc in yellow brass as can now be employed when a little aluminum is added.

The advantages of aluminum in yellow brass sand castings are as follows:

1. It removes the oxides from the metal and causes it to run free and fill all portions of the mold.

Fig. 2. Casting Showing Application of Yellow Brass Mixture for Fine Castings.

2. It obviates the formation of pin-holes in the castings.
3. It allows the castings to be poured flat on account of the greater fluidity of the brass when melted.
4. It gives a good surface to the castings and the sand does not adhere to it.
5. It allows a much greater amount of zinc to be used in the mixture, thus greatly cheapening it.

6. It allows the brass to be poured at a much lower temperature and reduces the loss of zinc by volatilization.

The amount of aluminum necessary for producing all these advantages is so small that it can scarcely be considered. It cannot be considered as an ingredient in the mixture and is really a deoxidizing material. The amount of aluminum employed must be quite small, otherwise difficulty will arise in the way of shrinkage. The more aluminum is used, the greater the shrinkage of the brass castings, and nothing is to be gained by the use of a considerable quantity. A small quantity will do the work as well as a larger amount, and at the same time the shrinkage is less. With the amount ordinarily used, the shrinkage of the brass is not increased. The amount of aluminum to be used in making yellow brass castings (provided, of course, it can be used at all) is as follows:

Yellow Brass	100 lbs.
Aluminum	1 oz.

This quantity, it will be appreciated, is very small, and even less can be employed. It can be added after the crucible has been skimmed and is ready to pour, or while it is in the fire. The amount of aluminum used is so very small that care must be taken to see that it actually enters the molten metal and is not left in the dross on the top.

Aluminum cannot be used for all kinds of yellow brass work and for plumbers' brass goods, cocks, valves, gas-fixtures or similar work to stand pressure it cannot be employed. It causes them to leak under pressure. But for other classes of work, such as saddlery hardware, automobile castings and the ordinary run of yellow brass work it will be found invaluable. To be sure it produces dirty castings if the brass is poured too hot, but with care and judgment, more good castings can be obtained with aluminum than without it. When a casting with aluminum in it is good, it cannot be equalled, and the dirt or dross is usually on the outside where it can be readily seen and the castings rejected. The castings will run sharp and true and a greater number of pieces can be put upon a gate. If aluminum is not used in the yellow brass mixture, it will usually be found that the mold will have to be poured on end with the clamps on it, or after a manner practiced before the advent of aluminum. When a little aluminum is used in the brass, however, the work may be poured flat and without forcing into the mold or pouring it smoking hot.

When to use aluminum and when to avoid it will have to rest with the brass molder, but it should be borne in mind that it should *never* be used in work to stand pressure, even though it be light.

Use of Lead.

The majority of yellow brass castings have some machine work done upon them, or are polished and buffed. For this reason, it is necessary to use lead in the yellow brass and there are very few brass castings now made which do not contain it. In fact, it is the exception rather than the rule. Lead also has another purpose in that it tends to make the brass run free and sharp and castings are less apt to leak under pressure when it is present.

The amount of lead used must be small and much over 3% is not advisable or the castings will be weak and the lead is apt to "sweat" out or segregate. The amount of lead may be increased to 4% without doing much harm, but if allowed to go over this quantity, trouble is apt to follow. With less than 3% of lead, the brass does not cut as freely as desired. It has been found by experiment that about 3% is right for ordinary work.

Gas Cocks and Fixtures

One of the largest uses of yellow-brass at the present time is the manufacture of gas-cocks and gas fixtures. The requirements of this class of work are as follows:

1. It must be as cheap as possible.
2. It must have a suitable yellow brass color.

It must cut freely.

Too much zinc cannot be used in the mixture or it will have a reddish shade that is undesirable. The color must be that of yellow brass. As the work is done upon automatic machinery, the brass must cut well. The following is the mixture extensively employed for this class of work:

Gas Cock Mixtures

Copper	66 lbs.	or 660 grams
Zinc	31 lbs.	or 310 grams
Lead	3 lbs.	or 30 grams
Total	100 lbs.	or 1000 grams

Aluminum should *not* be used in this mixture.

Fine Ornamental Castings

While the great proportion of art metal work is cast in bronze, as this is suited for the work far better than yellow brass, it is frequently necessary to make high grade yellow brass castings for art work and a suitable mixture is necessary. The cost of the mixture in such a case is of no importance, and casting qualities are of more account than anything else. The following mixtures will be found very suitable for the highest grade of work:

Mixture for Fine Ornamental Castings

Copper	75 lbs.	or 750 grams
Zinc	22 lbs.	or 220 grams
Tin	2 lbs.	or 20 grams
Lead	1 lb.	or 10 grams
Total	100 lbs.	or 1000 grams

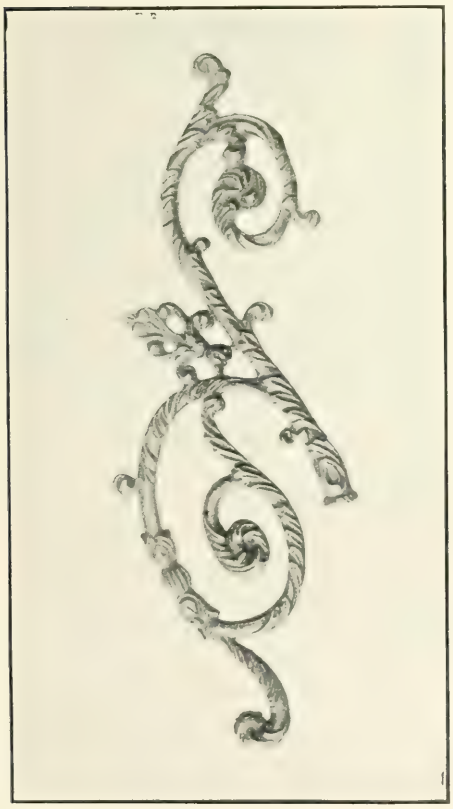


Fig. 3. Illustrating Mixture for Ordinary Ornamental Work.

In the preceding mixture for ornamental brass castings, the tin is necessary to strengthen and harden the metal. So little zinc is used that the mixture is quite soft without it. If, however, a soft mixture is desired, then 1 lb. of tin instead of 2 lbs. may be used. The little lead is used to allow chasing, cutting and polishing to be done on the brass readily, but there is not enough to cause trouble in casting or in dipping. The color of the mixture is greenish-yellow and this is really the most pleasing of all the brass-mixtures.

Aluminum should not be used in this mixture as it is unnecessary. There is so little zinc in the mixture that no difficulty will be experienced in casting it.

Ordinary Ornamental Castings

For ordinary work of an ornamental nature, it is unnecessary to use as expensive a mixture as the preceding one and the following may be employed:

Mixture for Ordinary Ornamental Castings

Copper	66 lbs.	or 660 grams
Zinc	33 lbs.	or 330 grams
Lead	1 lb.	or 10 grams

The lead is kept low in the mixture in order to produce a good dipping brass. Most ornamental castings are dipped in an acid dip to brighten them and if much lead is present, it causes trouble and it is impossible to obtain a bright surface on them. A little lead is desirable, however, as it allows machine work and polishing to be done without difficulty.

Aluminum can be used in this mixture if desired, but as a usual rule it is unnecessary, particularly if the work is quite small and is poured "on end". Large work can be cast with aluminum in the mixture, and the brass founder can readily determine when it is best to use it. Aluminum does not affect the dipping qualities of the brass.

"Light-Brass" is the scrap metal term applied to a general assortment of yellow brass scrap, such as old clocks, bird cages, lamp-burners, lamps, and similar material.

A good flux for refining solder, babbitt-metals, type-metals or other soft metal alloys, composed of tin, lead and antimony, with or without copper, is sal-ammoniac, 4 lbs.; sulphur, 2 lbs.; powdered charcoal, 1 lb.; and rosin, 1 lb. This is thrown on the surface and the metal stirred, after which the dross is skimmed off. This flux will remove zinc and other impurities.

Use of Calcium for Deoxidizing Magnesium.

The melting and casting of magnesium under ordinary conditions is a difficult matter. The enormous affinity of magnesium for oxygen and nitrogen causes the formation of a thick black scum on the surface when melted which increases when fresh metal is exposed as it is in pouring. This has been obviated by melting and pouring in a neutral atmosphere, but such a practice is difficult to carry out.

A new process of melting and casting magnesium by the use of metallic calcium has recently been patented by Berthold Hoffman and Robert Suchy of the Chemische-Fabrik Griesheim-Electron of Frankfort-on- the-Main, Germany. The process is so interesting, and coming as it does from the manufacturers of metallic magnesium, the inventors description of the process will certainly prove of interest. They say:

"Melting and casting magnesium and alloys thereof, and especially those that are rich in magnesium have hitherto presented many difficulties, because, even at the lowest possible temperature required for casting, the metal enters into reaction with the constituents of the air, becoming coated, for instance, with a black skin consisting of the lower oxides and nitrides and finally burning so that the casting becomes soiled to an objectional degree.

Processes are already known according to which the aforesaid difficulties are overcome, but the process in accordance with this invention possesses over these, the advantages of great simplicity, cheapness, and reliabliity.

We have discovered that the propensity of molten magnesium and alloys thereof to enter into reaction with the air is mitigated by the addition of a small amount of calcium so that, at the temperatures in question, magnesium and its alloys can be cast without any oxide and nitride being formed or any other injurious action taking place. Thus for instance, magnesium and its alloys, when mixed with from one tenth to one half of one per cent. of calcium flow, in the air, in a silver-white stream from the crucible, without the aforesaid dark skin being formed and burning taking place. They fill up the molds in a perfect manner, and they give dense clean castings which do not exfoliate under the action of the air. They come out of chilled molds quite clean and leave sand or loam molds without an objectionable skin. This remarkable action of calcium, can be obtained with an addition of even less calcium than that above stated. Magnesium, or magnesium alloys, treated, as aforesaid, with calcium, can be heated much above melting point without entering into reaction with the air and this property is not lost after repeated remelting. Besides this the presence of calcium has the further advantage, that it forms with the hydrogen, mostly contained in magnesium and its alloys, a hydrid which covers the surface of the fused metal, or alloy, thus greatly facilitating the production of dense castings free from hydrogen bubbles. It is not necessary to use the calcium, in the metallic form, as it can be introduced in the form of an oxide, or other compound, capable of being reduced by magnesium. Lime which is cheap and generally obtainable can be used; Clemens Winkler (see *Berliner Berichte* 23, 122) having already shown that it can, like other oxides be reduced by magnesium. The calcium can be furnished in any other suitable manner to the metal, for instance by the addition of a calcium compound during the electrolytic manufacture of magnesium. If an alloy is to be produced, the calcium may be used alloyed with one of the components of the alloy.

The following examples will illustrate how this invention can be carried out in practice, but it is not limited thereto:

Example 1: Into a suitable crucible 10 kilograms of magnesium and 50 grams of calcium, are introduced and the crucible is covered with a lid and heated to 700° centigrade. After energetic stirring, the melt is ready for casting.

Example 2: 10 kilograms of magnesium and 70 grams of powdered burnt lime are introduced into the crucible and the operation is further conducted as in Example 1.

It will be appreciated that the amount of calcium employed is so small that it cannot impart to the metal the characteristics of a calcium alloy. In fact the calcium so nearly disappears during the operation that the cast metal contains only a trace thereof, no more pronounced than the traces of other metals commonly existing in magnesium as innocuous impurities."

The Absorption of Brass, Copper, Silver and Gold Deposits by Soft Metals.

One of the peculiar features of electroplating is the fact that soft metals, such as tin, lead or zinc (and their alloys) will absorb deposits of brass, copper, silver or gold after a time and to such an extent that the deposit will entirely disappear. This fact has been known in many lines of trade for some time and particularly in coffin hardware and soft metal novelty trades, but it is not generally understood as an electroplating fact.

Heavy deposits of the metals enumerated will not be absorbed, at least they do not in a long period of time. It is the light deposits that have the property, but it is assumed that

Spelter Lamp Base, Upon Which a Brass Deposit Had Been Absorbed.

there is an absorption, even with a heavy deposit, and that there is sufficient metal left to still act as a covering for the metal.

The absorption is really a "soaking in" of the deposit and takes place after a considerable period of time has elapsed. The time taken may be from a few months to several years, according to the heaviness of the deposit. The deposit finally disappears as though it had evaporated and leaves the base metal exposed. It seems to be equally as apt to happen on spelter castings as on antimonial lead.

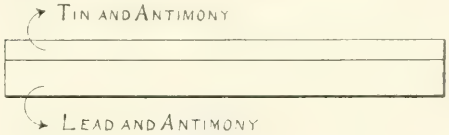
In the illustration is shown a spelter lamp base which has a part of a lamp made by the largest manufacturer of this class of work in the United States. The lamp had been brass plated and it was a good job too, for the lamp had the appearance of being cast brass. The lamp was left unused for a number of years (just how many it is impossible to say,, but probably from 5 to 10) and without anyone touching it. At the end of this time, the brass had entirely disappeared and the white zinc was left.

It is positively known that nothing had touched the lamp during this period and it had been protected from dust. The zinc had actually absorbed the brass deposit. There is probably an alloy formed when the phenomenon occurs.

The absorption of these deposits may be prevented by giving the soft metal a coating of nickel as this metal does not seem to have the property of "soaking in" and effectually prevents the absorption of other metallic deposits. This method is used by the manufacturers of coffin hardware and when employed, a light deposit of silver or other metal may be put on without danger of losing it within a short time through absorption.

The "Hoyt" Composite Soft-Metal.

A short time ago, the Hoyt Metal Co., of St. Louis, Mo., brought out a composite metal composed of a tin alloy on one side and a lead alloy on the other. The sheet is to be used to replace britannia-metal as it is cheaper and the surface is of practically the same composition. This composite metal has been patented by Lewis B. Tebbetts 2nd. of this company.



The patent states that the facing layer of the composite metal is composed of the following:

Tin	80% to 97%
Antimony	3% to 14%
Copper	0% to 5%
Nickel	0% to 2%

The backing layer of the sheet is composed of these metals:

Lead	70% to 90%
Antimony	4% to 15%
Tin	0% to 15%

In this backing metal, only the lead and antimony are essential and the tin may, in some instances, be left out.

Brass and Bronze Plating Solutions and How to Make Them.*

Seventh Paper.†

Use of Ammonia.

Ammonia, although rightly used is a good ingredient in a brass plating solution, is really the cause of more trouble than anything else, particularly in the hands of inexperienced platers or those who have had no experience at all. If platers would not use ammonia in a brass solution until they have completely mastered the subject, it would be found that one great obstacle would be overcome.

A good brass deposit can be obtained from a brass solution free from ammonia, and it is strongly recommended that those who experience difficulty in brass plating, leave the ammonia out entirely; and beginners should also avoid it until the solution has been thoroughly mastered. The problem is then much simplified and it will be found easier to make and run the solution.

The advantage of ammonia in brass solution is, it is believed, greatly overrated. While it has an advantage, to be sure, it is not as great as many platers suppose and an excellent brass deposit can be obtained without it. Ammonia, when present in a brass solution, has two advantages:

1. It tends to keep the anodes clean and allows less free cyanide to be used.

2. It brightens the brass deposit to a certain extent.

The great difficulty with the majority of platers who have to deal with a brass solution is that they use too much ammonia. While a little ammonia is a good thing in a brass plating bath, too much is harmful, and it may be said that the majority of platers use too much and so bring on the well known difficulties of an off-color deposit or a zinc instead of a brass deposit. Ammonia must be added sparingly when it is used or trouble will surely follow.

When a brass solution is made up of cyanide and the carbonates of copper and zinc, it will be found that if the free cyanide is adjusted so that it is about 4 oz. to the gallon, an excellent brass deposit can be obtained. It is the simplest form of solution and is to be recommended on account of its simplicity. If, to such a solution that is working well and gives a good yellow brass deposit, a little ammonia, say 2 or 3 oz. to the gallon is added, it will be found that the anodes keep cleaner for a longer time and that the brass deposit is slightly brightened. Other than this there is no advantage in its employment. If the amount of ammonia is increased, it will be found that the color of the deposit will begin to change and finally zinc will be deposited when a large quantity is used. It has been found by experience that from 2 to 4 oz. of strong ammonia water are about right in order to obtain the best results, and if more is introduced the deposit will begin to suffer.

The right quantity of ammonia in a brass solution cannot be given as it will depend upon the amount of free cyanide present. The more free cyanide is used or is present, the less ammonia can be employed. Ammonia tends to bring down zinc in the solution so that by its use a deposit may be changed in color without adding any zinc. The less free cyanide is employed, the more ammonia can be added. For this reason, therefore, no hard and fast rule can be laid down and the quantity of ammonia to be used can be given only approximately. *It may be said, however, that from 2 to 4 oz. (liquid) of strong ammonia can be used to each gallon of brass solution.*

The brass solution should not smell strongly of ammonia, but be quite perceptible, however, when one is close to the tank. There should be a decided ammonia smell, but no more.

If, by mistake, too much ammonia has been added, then it can be removed only by heating the solution and driving it off. It will also evaporate or free itself in the cold, but this takes some time and the only known rapid method is to heat the solution as hot as possible to drive it off.

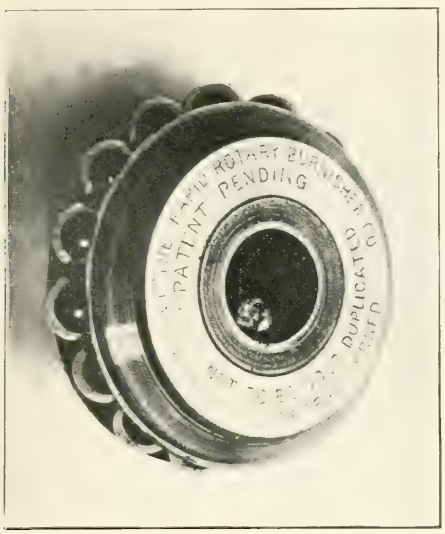
*Continued from THE BRASS WORLD, June, 1912, page 206.

†These papers will be continued.

Streaks on nickel plated goods are frequently caused by buffing or polishing dirt not having been completely removed from holes or joints. The dirt works out during plating and forms the streaks. If watched, these streaks will always be found to start from a hole or crevice and work upwards.

The "Rotary" Ball Burnisher.

The use of steel balls has now become so extensive in the tumbling of small metal goods in order to burnish them that it is not surprising that attention should have been directed in other lines to ascertain whether the steel balls could not be used for burnishing outside of the tumbling barrel. The result of this attention was the discovery that steel balls could be used for burnishing instead of the ordinary hard burnishing tool and it is accomplished by holding the balls in a groove so that they are free to revolve, and then revolving the container in an ordinary polishing lathe spindle.



Ordinary Form of the Rotary Ball Burnisher.

In THE BRASS WORLD, January, 1912, page 26, the method of burnishing by means of steel balls in the aforesaid manner was first described. The article was an abstract of the patent that was issued to Benjamin F. Dingley of Silver Spring, R. I. The appliance is now being placed on the market in a number of different forms, both for use on a polishing lathe or on a flexible shaft, and in a number of different shapes for varying contours of surface.

A standard shape is herewith shown and the balls are held loosely in the container. The container is then placed on a lathe spindle and rotated. The work is then held against the balls and the surface lubricated with soap water, regularly used in burnishing, and the operation becomes simple. High-lights on an article may be burnished or the whole surface treated. As steel balls are both glass hard and highly polished, like the surface of a steel burnisher, the advantage of the rotary burnisher will at once be appreciated.

The burnisher is manufactured by The Rapid Rotary Burnisher Co., care Baker & Winsor, 189 Eddy St., Providence, R. I.

The Suit of the Government Against the Aluminum Trust.

In the United States Court, at Pittsburgh, June 7, a decree was entered against the Aluminum Co. of America. Following the Government's civil suit, filled a few weeks ago, charging the corporation with monopolizing the industry, the decree abrogates alleged unlawful contracts and restrains the defendant company from negotiating similar undertakings or pursuing unfair methods toward competitors.

The decree was accepted by the Aluminum company as a result of protracted negotiations with Attorney-General Wickersham prior to the filing of the suit.

The mandate was drawn and accepted by the Government and the defendant before the suit was initiated. This is the first time a decree has been agreed upon under the Sherman law before court proceedings had been started.

The company is forbidden to participate in any combination or agreement to control the output or prices of aluminum. It is enjoined from combining, by stock ownership or otherwise, with other manufacturers for this purpose. The decree places a long list of specified unfair methods of competitors under the ban of the court.

Provisions of alleged agreements to suppress competition between the Aluminum company and the so called Swiss, or Neuhausen, Co. of Europe; the General Chemical Co., the Norton Co., the Pennsylvania Salt Manufacturing Co., Gustave A. Kruttschnitt and James C. Coleman, both of Newark, N. J., are abrogated by the decree.

Whenever it is shown that substantial competition has arisen in the aluminum industry, the decree may be modified upon the production of evidence that it is working an injustice. Application for modification cannot be made oftener than once in every three years.—*The Engineering and Mining Journal.*

The Trisalytes; New and Important Compounds for Barrel and Mechanical Plating in all Metals.

By Carl Dittmar.*

One of the most important developments in the electro plating industry during recent years is the barrel or mechanical plating method. This manner of depositing upon small articles has reached stupendous proportions and has enabled the manufacturer to produce small articles upon an economical scale that in the past was almost prohibitive on account of the cost of manual labor.

Basket plating, the forerunner of the mechanical plating method, was always costly on account of the use of metallic baskets upon which the metal was largely deposited while the goods themselves received very little deposit. Again considerable time was lost on account of the necessity of changing the position of the goods to be plated so that they may be coated on all sides.

With the introduction of barrel plating considerable trouble was experienced at first because the requirements of the method were not fully understood and even today many platers have more or less difficulty because it is not always understood that a higher voltage, a greater concentrated solution and a solution of higher conductivity and low internal resistance are required to obtain a successful deposit.

Concentrated solutions are essential in barrel plating on account of the relatively large cathodes in proportion to the anode surface. This difference must be taken care of by concentration and it is for this purpose that Trisalyt is especially recommended.

These salts possess all the essential requirements, that is, a higher concentrated metallic compound with sufficient free cyanide of sodium for perfect precipitation together with a conducting or a reducing salt that acts in conjunction with the cyanide of sodium giving a greater reducing action upon the anodes. This is especially required for the proper maintenance of concentrated barrel solutions. Such a salt, which is always uniform both as to metallic and chemical contents, will certainly appeal to the progressive plater.

Trisalyte is, therefore, the most important addition to the art of plating in recent years and is fast becoming a necessity to the plater who must show absolutely uniform results in the shortest possible time and at a minimum expense.

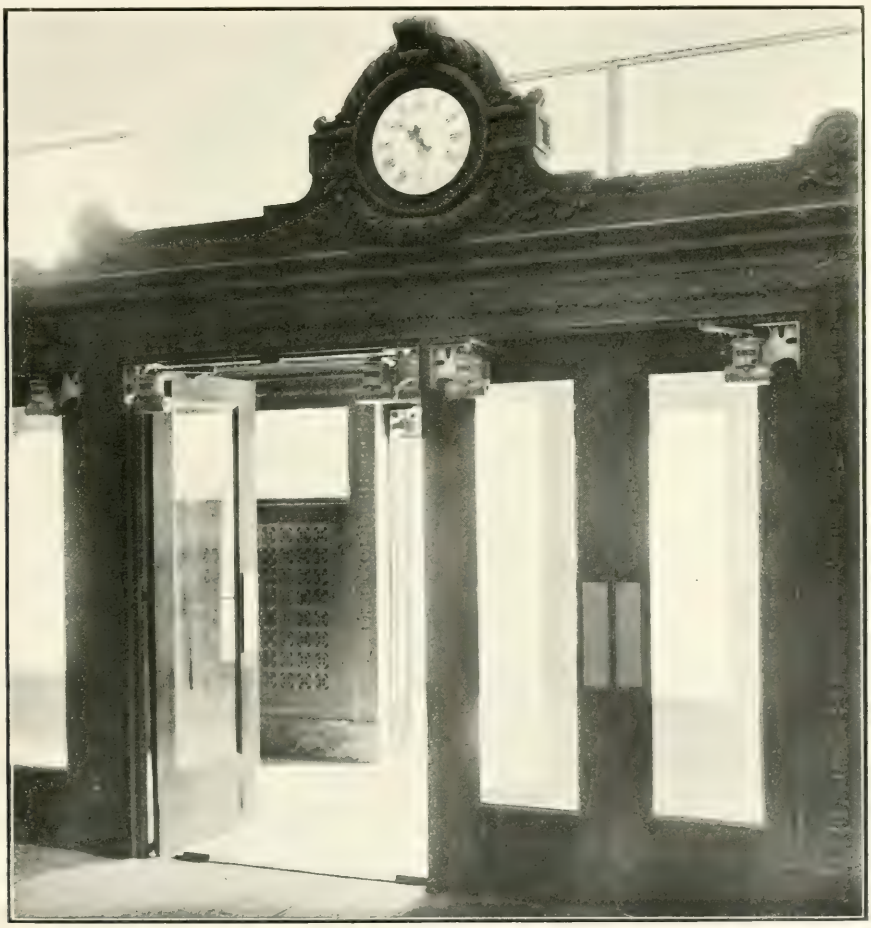
* With the Roessler & Hasslacher Chemical Co., 100 William St., New York City.

Danger in the Transportation of Metallic Sodium.

Mention has been made on more than one occasion in our columns of the danger arising from the careless packing and shipment of ferro-silicon. Now to this material must be added metallic sodium, respecting which an inquiry was held under the Board of Trade in March. Major A. Cooper Key has now issued his report, which is concerned with the loss of the s.s. *Hardy* in December of last year. The boat left Tréport for London with 550 tons of cargo, including two tons of metallic sodium, which is used, among other things, in the manufacture of aluminum. This was stowed on deck, and owing to heavy weather, the lashings were destroyed, and one of the cases of sodium was broken. The metal, coming in contact with the water, caught fire and by exploding burst open other cases, and in a short time a considerable portion of the ship was burning, dense and irritating caustic-soda fumes being emitted. The only effective way of dealing with the accident was to shovel the material overboard, as, obviously, the use of the hose would have made matters worse. In the result the vessel was practically split in two by an explosion, the mate was drowned, and several members of the crew were burnt, one so badly that he died of his injuries. The opinion expressed in the report was that the packing of the sodium, in view of the fact that it was to be stowed on deck, was inadequately done. Further, that it was ill-advised to have stowed on the hatchway a large quantity of material presumably dangerous owing to its inflammable properties. It is stated that properly packed and carried below decks, with reasonable care and precautions to prevent shifting, metallic sodium might safely be conveyed by sea, and that the actual loss of the vessel was probably due to the explosion of other chemicals which happened to form a portion of the cargo.—*The Ironmonger.*

The Rust Proofing of Large Steel Material.

We are indebted to the Bradley Rust Proofing Co., 35 Ferris St., Brooklyn, N. Y. for the accompanying photograph. This company are patentees of the Bradley rust proofing process, by means of which it is possible to impart a black, rust proof coating upon iron or steel goods. This black finish is not only rust proof, but has a very pleasing appearance so that it has found good use in ornamental work. The photograph herewith reproduced is one of the largest articles yet turned out and shows the possibility of the process. It is in one of the large office buildings in New York City and which has recently been constructed.



Steel Interior Decorative Work Rust-Proofed by the "Bradley Rust Proofing Process."

A "Kink" in Grinding Aluminum.

A writer in the American Machinist, who has had difficulty in grinding aluminum made the discovery that the use of paraffine wax on the emery wheel would overcome the trouble. Edward J. Ruthman of Cincinnati, Ohio is the discoverer of this method and he says:

"Recently we had occasion to grind a lot of aluminum castings on an emery wheel, and encountered considerable difficulty as the aluminum stuck on the wheel. It was impossible to obtain a smooth and satisfactory job with the wheel in this condition. Continually cleaning off the wheel with an emery-wheel dresser consumed too much time. We then took paraffine wax and held it on the wheel to fill up the pores and proceeded with our grinding without any further trouble."

The Direct Determination of Small Amounts of Platinum in Ores and Bullion.*

By Frederic P. Dewey.†

By the old method of determining platinum in ores and bullion, the silver-alloy first obtained in the regular course of assay is parted in strong sulphuric acid and the residual metal weighed. This is re-alloyed with silver by a second cupellation and parted in nitric acid, the residual metal being again weighed. Any difference shown between the two weighings is assumed to be, and is called platinum. Sometimes it is so, and if any considerable amount of platinum be present, there will be a decided difference between the two weighings; but a slight difference is no real evidence whatever of the presence of platinum. On the other hand, the second weight may be equal or possibly exceed the first, even when traces of platinum are present. Again, other members of the platinum group may go into solution in nitric acid more or less. If present, these would be called platinum and escape detection. The method does not provide any direct tests whatever as to the presence or absence of platinum. It is often indecisive, and sometimes gives erroneous results. It is, therefore, quite unsatisfactory.

Being called upon many times to determine platinum in a wide variety of materials, particularly when present in very small amounts I have realized the disadvantages and defects of the old method.

In an article[**] on the solubility of gold in nitric acid, I have briefly outlined a method of gathering a little gold out of a solution containing much silver, which furnishes the basis of an excellent method for the direct and absolute determination of small amounts of platinum, which has the added advantage that the metal weighed may be subjected to suitable tests, to determine that it really is platinum, and to reveal the presence of other members of the platinum group.

In the regular course of assaying for the precious metals, gold is parted from silver by dissolving the silver in nitric acid. If platinum be present in small amounts only, it will readily go into solution in the nitric acid. If now a limited amount of hydrogen sulphide be added to the solution from parting, any platinum present will be precipitated as sulphide, along with some silver sulphide. On filtering off the precipitate (which generally is sufficiently washed by the operations necessary to transfer it from the precipitating-dish to the filter), the moist filter is transferred to a small porcelain crucible, dried at a low heat, and burned off by gentle ignition. This transforms the sulphide precipitate into a metallic sponge, which is wrapped in a small piece of thin lead foil and cupelled. The resulting bead is then parted in strong sulphuric acid, when the platinum will be left as a dark residue, generally collected in spongy form, even when minute in quantity. This sponge, after reboiling in fresh acid, if necessary, is suitably washed by decantation, annealed, and weighed.

Generally, the final metal speaks for itself as being platinum, but, if there should be any doubt, it may be dissolved in a drop or two of aqua regia and gently evaporated. The solution obtained may be tested with potassium iodide, or a few small crystals of ammonium chloride may be added, when the characteristic precipitate will show itself. As a further test, this may be filtered off and gently ignited to produce spongy platinum. If the amount of the final metal be considerable, the platinum may be determined by the double-chloride method. Any decided difference shown would indicate the presence of other members of the platinum group, for which direct test could then be made.

For precipitating the platinum and the necessary silver from the parting-solution, a very dilute solution of hydrogen sulphide should be used. One part of a strong solution should be diluted to from 10 to 20 parts with water. If the solution of silver nitrate be strongly acid, it should be largely diluted, or it may first be evaporated and then diluted. The very dilute hydrogen sulphide solution should be added very slowly to the silver nitrate solution with constant stirring. The solution is, of course, at once darkened, but there should be no immediate separation of a visible pre-

*From the Transactions of the *American Institute of Mining Engineers*, New York Meeting, Feb., 1912. Published by permission of the Director of the Mint. Also by permission of the *Journal of Industrial and Engineering Chemistry*.

**Journal of the American Chemical Society, Vol. XXXII, Mar. 1910, pg. 318.

†Washington, D. C.

cipitate. The solution should be stirred occasionally, and in about 2 hr. flocks of precipitate should appear. It may be filtered in from 3 to 4 hr., but it is a good plan to let it stand over night if possible.

The amount of hydrogen sulphide required depends, of course, upon the amount of platinum present. If this should be roughly known or suspected, the amount used should generally be enough to precipitate the platinum and from three to five times as much silver. On an entirely unknown ore, I should at first use 1 cc. of strong hydrogen sulphide solution diluted to 15 cc., and reserve the filtrate from the sulphides for retreatment, if necessary. On an unknown bullion I should use 2 cc. of strong solution diluted to 30 cc., partly because bullions are liable to carry much more platinum than any ordinary ore, and partly because the volume of the silver nitrate solution from parting the gold must necessarily be larger. If, however, it is known that minute amounts of platinum are present, it is still necessary to use sufficient hydrogen sulphide to give a silver bead large enough to handle comfortably. For this reason I seldom use less than the equivalent of 1 cc. of strong hydrogen sulphide solution.

It may happen that the final metal shows the yellow color of gold, due to the fact that exceedingly fine float-gold passed over in decanting the solution of silver nitrate from the gold. In such a case the metal must be re-alloyed with silver and the treatment repeated. When the proportion of gold to silver in the metal being parted is so small that the gold separates in a very finely divided state, it will often save trouble to filter the silver nitrate solution, to separate any float-gold, before adding the hydrogen sulphide.

This method has been used with the utmost satisfaction in determining very minute amounts of platinum in various silver-products directly. Much of our silver coinage, for instance, will show a few tenths of a milligram of platinum in 100 g. of coin. Recently I examined samples from two purchases of fine silver. Very large samples were dissolved in nitric acid. The acid in portions was poured upon the samples and allowed to act at a gentle heat until exhausted. Finally, a small amount of residual silver was removed from the solution and dissolved in a small amount of fresh acid, the solution being then united with the main solution, and the whole evaporated nearly to dryness. It was then diluted to about 250 c.c. and 5 c. c. of strong hydrogen sulphide solution diluted to about 50 c. c. was poured in with constant stirring.

This operation concentrated the gold and platinum of the silver into a small amount of sulphide precipitate. This precipitate was filtered off, roasted and cupelled. The resulting bead was parted in nitric acid, and the gold was determined. The silver nitrate solution was treated with dilute hydrogen sulphide solution, equivalent to about 1 c.c. of strong solution and the platinum parted from the silver by strong sulphuric acid.

These two samples yielded the following results:

	Silver Taken Grams	Gold Found Mgrms.	Platinum Found Mgrms.
No. 1,	122.32	0.28	0.07
No. 2,	125.47	0.12	0.18

In case we have a material containing a considerable amount of platinum, the well known fact that platinum alloyed with silver is not entirely soluble in nitric acid must be considered. In such a case, the gold from the first parting in nitric acid must be alloyed with silver and parted in nitric acid a second time, or even a third time, before proceeding to precipitate the platinum from the parting solutions with hydrogen sulphide.

It is also very satisfactory to use the general method of gathering gold in a precipitate of silver sulphide in determining minute quantities of gold in high grade silver, such as that produced by electrolytic refining. It is comparatively easy to gather the gold from very large samples of silver, up to 100 grams or more, into a decigram of silver, and then part by nitric acid as usual.

Probably this method of precipitating a noble metal in solution, or removing in a liquid, by adding hydrogen sulphide in the solution, could be used to advantage in determining gold in metallic copper and similar materials.

Fire-gilding produces the most durable form of gold plating known and when well done, articles will wear for years without showing the base metal. It is little practiced in the United States, although much more extensively used in England.

"Prometheus," a New Nickel Plating Solution.

A new nickel plating preparation is now being imported into this country from Germany and which is called "Prometheus" nickel salts. It is made by Dr. Friedrich Neubeck, Specialfabrik für Galvanotechnik, Schwanheim am Main, Germany. Adolf Neubeck, 216 Fifth Ave., New York City, is the American representative.

The salts are used, according to the directions compiled by the importer, in the following manner:

To each gallon of pure drinking or rain water take 2 lbs. of "Prometheus."

Heat the water to about 175° Fahrenheit in an earthen or enameled vessel, add "Prometheus" gradually stirring with a wooden ladle to facilitate liquification. Be sure that all "Prometheus" is dissolved, any undissolved parts should be treated with boiling water, and then added to the original fluid.

While making solution avoid contact of "Prometheus" with metals, such as iron, copper, zinc, etc., as it will spoil the bath.

The cooled solution is ready for use and must possess a specific grav. of about 16° Beaumé.

Use large anodes.

The anodes should be 98% pure nickel.

The total surface area of the anodes should be fully as large as the total surface area of the object to be plated.

The normal temperature of the solution to be held at about 60° Fahrenheit.

The most desirable bath tension for nickel plating is 2¼ to 3 volts; with lower temperature the tension should be correspondingly increased.

The current of the "Prometheus" rapid nickel plating solution or bath should be about 10 amperes to each square foot of surface area of the object to be plated.

Reaction of Solution and Correction

The reaction of the bath must always be acid, so that blue litmus paper will turn distinctly red, while red Congo paper should retain its color.

To test the bath, which should be done frequently, dip a strip of the above mentioned papers into the solution. Should the litmus paper turn red and the Congo paper turn blue, the solution contains too much sulphuric acid, which can be remedied as follows:

Mix carbonate of nickel-oxide with a small quantity of the solution in a porcelain or earthen bowl to a paste; add this to the bath stirring constantly with a wooden ladle until the Congo paper ceases to turn blue. The litmus paper, however, should still turn red.

If in testing the bath, the blue litmus paper does not turn red, the solution has become neutral or alkaline, and the acid reaction must again be produced as follows:—

If the specific grav. is not less than 16° Baumé, add small portion of diluted sulphuric acid, one part to ten parts of water, until litmus paper again turns red, but if the Congo paper turns blue too much sulphuric acid has been added, and this must be reduced with carbonate of nickel oxide as directed above.

Should the specific grav. be less than 16° Baumé, add 1 lb. "Prometheus" to each five gallon bath, heat part of the old solution to boiling point, in which dissolve "Prometheus", then pour back into bath, hot, stirring constantly.

The superiority of the salts, it is claimed, is as follows:

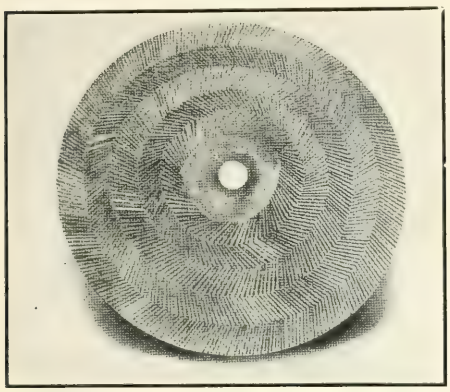
1. No additional equipment is required.
2. The work is done in one-third the time of the old nickel salt baths.
3. Saves from 10% to 15% in anodes.
4. The deposit is absolutely non-porous, thereby overcoming corrosion.
5. Produces a pure, silver-white color.
6. Deposit can be made up to 1 m/m thickness without danger of peeling.
7. Solution will outlive many times the old nickel salt baths.

The principal difficulty in electroplating is in the cleaning of the work to be plated. Imperfect cleaning is the cause of more failures than any other.

At the current density employed in silver plating, any copper which may be in the solution does not deposit with it. If the current density is increased, however, the copper will deposit with the silver, but this is at so high a density as to be commercially unsatisfactory. In silver plating solutions, therefore, the copper remains in the solution, and does not deposit with the silver. As all commercial silver contains a little copper, the amount of this metal in a silver plating bath is constantly increasing. Solutions that are very old contain a large amount of copper.

Circular Files.

A new tool in the shape of a circular file has recently been placed on the market by the Hayes File Co., of Detroit, Mich. It is intended for filing solder, aluminum, babbitt-metal and other soft metals. This file shown herewith is 14 inches in diameter and 1 inch in thickness. The teeth are situated on both sides of the file and are staggered as shown.



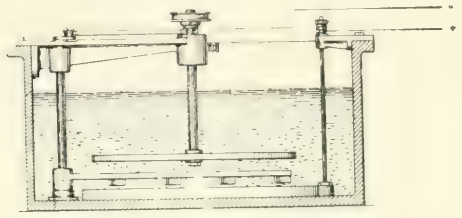
A Rotary File.

When used the rotary file is mounted like an emery wheel but is revolved at a much slower speed. About 200 revolutions per minute are employed for this size wheel. Other sizes are manufactured. It is stated that the Ford Motor Co. of Detroit, Mich., use the file for filing or surfacing the babbitt on connecting rod caps. The file does not clog on account of the manner in which the teeth are cut and it will undoubtedly find a ready use in brass foundries and other establishments for filing soft metals and upon work that has previously been done by hand.

Springs may be plated with nickel, but frequently will break when brass or copper plated. This is caused by the penetration of the hydrogen gas, given off during the plating, into the steel. It renders them brittle. To prevent breakage, the current should be as weak as possible so that practically no gas is given off. This fact applies to hardened steel springs. Those with the temper produced in drawing the wire and low in carbon are not affected.

Use of Wood Pulp in Nickel Plating Solutions.

In the manufacture of phonograph records, a master record is first made and from this impressions in wax or other material are made for the sound records ordinarily employed. This master record is made of copper, and in order to impart to it a hard, resisting surface, it is customary to nickel plate it with a thin film of nickel. This nickel deposit, however, must not obliterate the fine, delicate impression of the sound and much care is necessary in carrying out the nickeling to avoid it.



Apparatus for Nickel Plating Phonograph Records in Which the Wood Pulp is Used.

In nickel plating, hydrogen bubbles are formed on the nickel deposit to a greater or less extent, depending upon the current density and the solution. These bubbles are a direct obstacle in nickel plating the sound records and for this reason, Jonas W. Aylesworth of Thomas A. Edison, Inc., of East Orange, N. J., manufacturer of phonographs, has devised and patented a process for removing these bubbles of hydrogen from the surface of the nickel deposit. His method is as follows:

A quantity of wood pulp is treated with a 5% solution of sodium hydroxide, washed and then treated with hydrochloric acid and finally washed free from it. This wood pulp is then added to the nickel plating solution.

The theory of the action of the wood pulp is that, during the agitation of the nickel solution during the plating, bubbles of hydrogen are removed or brushed off. At the same time, the inventor says, the surface of the nickel deposit is burnished to some extent by the constant action of the wood pulp upon it.

The apparatus shown in the illustration is that employed by the inventor for nickel plating the master records or reproductions from them. The solution is agitated in the manner shown.

A New Process for Soldering Aluminum.

A new method of soldering aluminum has been discovered by Braxton D. Avis Jr. of Clarksburg, W. Va., and has been patented by him. He has found that stannous chloride (tin salts or the so-called protochloride of tin) is strong reducing agent when used as a flux in soldering aluminum. Its affinity for oxygen is great and for this reason it acts in a very beneficial manner when used on the surface of the aluminum to be soldered. He does not use the stannous chloride direct, but mixes it with zinc chloride, and also a small quantity of powdered tin. The tin is for the purpose of neutralizing any free acid that may be present.

The manner of making the flux is as follows: From 2 to 3 parts of stannous chloride (proportions need not be exact) are mixed with 1 part of chloride of zinc and the mass then heated until it liquefies so as to expel the free acid present. On cooling, it assumes a pasty form and is then mixed with a small quantity of powdered tin, as previously mentioned, to neutralize the last traces of free acid. The flux is now ready for use.

The author describes the method of soldering with the flux in the following manner:

"To tin the surface of the aluminum I now apply this paste or compound to the parts I desire to solder and subject it to a heat somewhat below redness. This can be accomplished by merely holding the parts in the flame of a Bunsen lamp or when the parts are large, to use a blow pipe and direct the flame on the parts to be soldered. When the proper temperature is reached the aluminum becomes coated with an oxide of tin and zinc. When this coating is removed by a suitable instrument or brush, the aluminum surface is found to be coated underneath with a bright film of tin. The oxide should be removed while the aluminum is still hot and the tin in a melted condition. From this point on, the soldering of aluminum becomes as simple as that of tin, and two surfaces of aluminum previously tinned as above described, can be joined together, no especial solder being required. Any solder can be used that can be used on a tin surface, also aluminum surfaces so coated may be joined to other metallic surfaces with the proper solder and flux. The chloride of zinc acts as a flux to remove the oxide of aluminum coating, thus leaving a large portion of the stannous chloride to combine with the aluminum surface and deposit thereon a coating of tin thereby obviating the necessity of the extra step of tinning where other than a stannous compound is used in coating the aluminum. Again, where two surfaces of aluminum are to be joined together which can not be rubbed with solder or a soldering tool, such as two flat surfaces, by first giving both a preliminary coating of tin by my process, I can then solder them by using any suitable solder and flux. When the solder is used with the proper flux on such a tinned surface, the solder flows evenly, and seems to form a more perfect joint. Surfaces of aluminum can be first prepared by this method for soldering, and then soldered at any time afterward."

Use of Steel Rolls in Cold Rolling Metals.

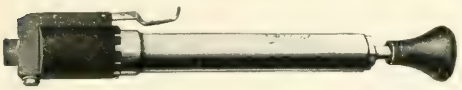
When the Athenia Steel Co., of Athenia, N. J., was started, great difficulty was found in obtaining rolls to cold roll the steel which they manufacture. Chilled rolls were not sufficiently hard, and the surface was not smooth enough. They found it difficult to obtain a roll that would stand the severe use without breakage.

After trying most of the various grades on the market, without finding a satisfactory one, they decided to import the best grade of Swedish alloy steel and make the rolls themselves. The machining of the rolls is done at the works of the company, and the exact size is given it. The rolling surface is then tempered to a glass-like hardness which it has been found will wear much longer than when done in the ordinary way. These rolls have been found satisfactory for rolling steel, brass, copper, silver, bronze and all other metals that are cold rolled. While the roll was first made for the cold rolling of steel, the rolling of other metals on it has been found equally as satisfactory. These rolls are now being placed on the market, as they were found so serviceable in the works of the company, that it was decided to give the trade the benefit.

The so-called pyrophoric or "sparking" alloys, which emit sparks when struck or filed, consist of an alloy of 70% cerium and 30% iron.

A Power Hand-Rammer for Bench Molders' Use.

While power rammers have been on the market for some time, they have been of large size for use in ramming large molds on the floor and cannot be used for bench work. The extensive use of compressed air in foundries has, however, made it possible for this valuable agent to be carried to the benches used in the brass foundry, and, indeed, many foundries have so equipped their works that a molder may use air instead of the old-fashioned bellows for blowing the



Power Hand-Rammer.

sand and parting material from his mold. Then, too, when molding machines are used, compressed air is usually employed for operating them. Air, therefore, is more or less extensively used and will be used to a greater extent in the future.

The Ingersoll-Rand Co., 11 Broadway, New York City, have recently brought out a new type of rammer for both bench and floor use and which is made in two sizes to accommodate each condition. The bench rammer is herewith illustrated. It is operated by compressed air and is to be used in place of the ordinary hand bench rammer. The advantage of this rammer may be appreciated by the following table indicating the time saved in ramming a mold:

Hand Rammer	Power Rammer	Time Saved
5 minutes.....	1 minute.....	80%
10 minutes.....	1½ minutes.....	85%
20 minutes.....	3 minutes.....	85%
35 minutes.....	8 minutes.....	77%
60 minutes.....	10 minutes.....	83%
90 minutes.....	16 minutes.....	82%
120 minutes.....	27 minutes.....	77%

Some of these tests were upon large floor molds, but as the rammers are the same, the time saved is noteworthy. These results were obtained on regular work.

The advantage of the rammer will readily be appreciated as it requires no skill to operate it and no manual labor such as required in ramming with the ordinary hand rammers.

Use of Core-Oils in French Foundries.

In the *Daily Consular and Trade Reports*, Consul General Frank H. Mason of Paris, France, makes the following statements in regard to the use of core-oils in France. He says:

For casting aluminum.—In principle, founders avoid the use of glutinous substances in order to preserve the utmost porosity of the sand molds, for which they use a suitable mixture of siliceous and argillaceous sands. But for the cores of complicated molds they use for each 100 kilos (kilo=2.2 pounds) of sand any one of the following substances: From 1 to 3 kilos of dextrine, whale oil, or resinous gum.

For cast steel, malleable.—There is employed for molds a clean "poor" sand, with which is mixed 5 to 10 per cent "glutin" or vegetable glue (gliadine). For making malleable steel castings there is also employed clean highly siliceous sea sand, mixed with 2 to 5 per cent glucose.

For cast iron.—With a sand maigre (green sand) there is mixed for making cores 2 to 5 per cent of a mixture of equal quantities of linseed oil and dextrine, or linseed oil and molasses.

For casting bronze.—For this there are various methods, but the mixture employed for molds by the leading bronze founders of Paris is 60 per cent new sand, 40 per cent old sand, 8 ounces of linseed oil. Some founders use the same combination of old and new sand, but instead of linseed oil they add 2 to 5 per cent of a special product known in France as "agglutinol," the exact composition of which I am unable to give, but it contains principally glutin or gliadine.

As to quantities used, it is only possible to ascertain that a foundry of average capacity in this country would use from 1 to 1½ tons of core oil, or the substances above given, the average proportion used being 3½ pounds of fixative to 100 pounds of sand.

Hardness testing machines are useful in determining the temper of rolled or drawn brass and are now used by some rolling mills in determining it.

A Flux for Pickling Iron or Steel Previous to Tinning.

In tinning by the ordinary method, iron or steel is first pickled in dilute sulphuric or muriatic acids to remove the scale and oxide, after which it is dipped into a flux of chloride of zinc and then immersed in the tinning kettle containing molten tin. The chloride of zinc flux enables the tin to adhere to the iron or steel forming the well known tinned material, such as tin-plate or similar tin coated goods.

Frederick F. Farnham of The American Sheet & Tin Plate Co., of McKeesport, Pa. has recently patented a modification of this tinning process in that instead of using chloride of zinc as the flux, chloride of lead is employed. The lead chloride, however, is insoluble (or nearly so) in water so that he employs a bath of it while molten.

The chloride of lead is preferably mixed with from 10% to 25% of tin chloride, but the inventor says that this may be omitted although better results are obtained with it. The iron or steel to be tinned is dipped into this molten bath and then into the regular tinning kettle containing the molten tin. The chloride of lead removes the scale and oxide from the iron or steel and leaves it free to unite with the tin. Just what the action of the chloride of lead is, is not clear although it possibly may act as an acid or a lead-iron oxychloride may be formed. The scum which forms on the surface of the flux, may be removed and the lead recovered from it.

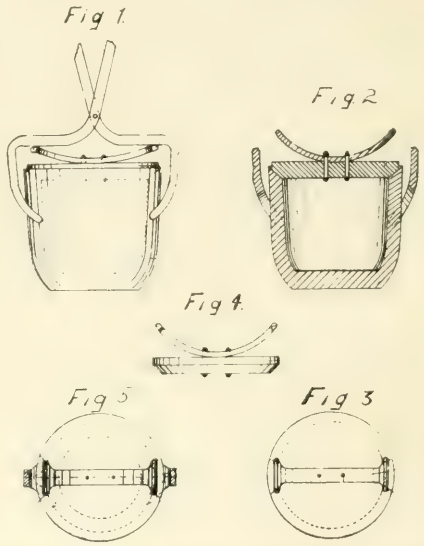
It is stated that the flux is not expensive for the reason that the tin and lead may be recovered from it when it is skimmed off either from the top of the molten tin or the flux bath in the form of a scum. It is claimed that the flux cleans the iron or steel from scale in a very thorough manner and the adhesion of the tin is greatly increased.

The chloride of lead bath, the inventor says, acts both as a pickling material and a flux for tinning so that one operation is dispensed with. It is also stated that it may be used for coating iron or steel with zinc or lead as well as with tin.

Soft solder deteriorates with age, particularly if not kept dry. When such old solder is melted, a heavy film forms and it does not flow freely.

A New Form of Crucible Cover for Preventing the Oxidation of Molten Metals.

A new form of crucible cover for preventing the oxidation of molten brass and other metals, and at the same time, obviating, to a partial extent the loss of zinc, has been patented by Thomas McGrath*.



Crucible Cover for Preventing Oxidation of Metals.

The improvement over the former cover invented by Mr. McGrath is in the manner of holding it on the crucible. As will be noticed from the illustrations, it is held by the tongs and needs no other adjustment. If desired the cover may be made of the same material used in the crucible, or it may be made of sheet iron. The spring on the top holds the cover in position when the tongs are placed on the crucible, and when the metal is poured there is no oxidation and the skimming of the crucible while the casting is being poured is unnecessary.

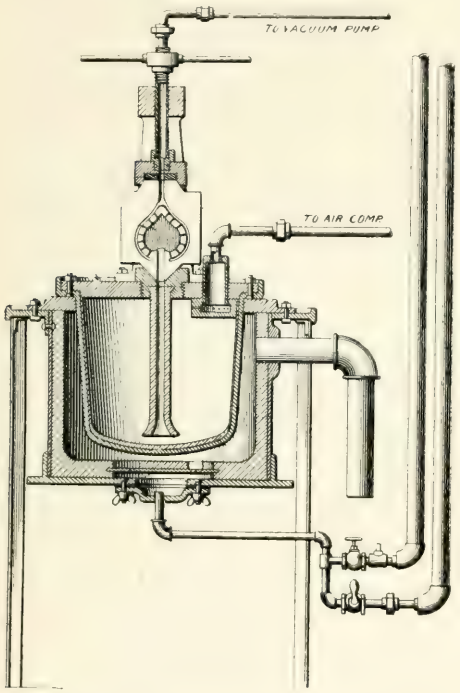
Chills may frequently be used on aluminum castings in place of risers for preventing the shrinking of heavy portions. A piece of clean, sheet copper of sufficient thickness for chilling the casting without melting should be used. Copper is preferable to brass for the purpose.

*Chester, Conn., R. F. D. No. 29.

The "Wetherill" Pneumatic Casting Apparatus.

A new form of pneumatic apparatus for making die castings has been patented by S. P. Wetherill Jr., and J. P. Wetherill Jr., of the Wetherill Finished Castings Co. of Philadelphia, Pa. This apparatus is herewith illustrated.

The metal to be cast is melted in the pot, which is made of cast-iron or other suitable material, and the mold is placed on the top



"Wetherill" Pneumatic Casting Apparatus.

with the tube at its bottom reaching to the metal. This tube serves as the gate of the casting and reaches under the metal. The top of the melting pot is hermetically sealed and through it a pipe passes for conducting the compressed air. This pipe is connected with an air compressor so that, by admitting the air under pressure, the mold is filled.

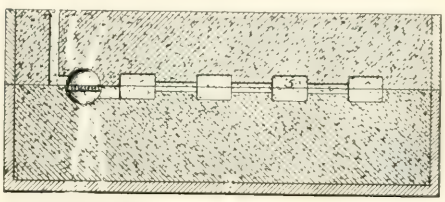
The end of this air tube, inside of the melting pot is made of "rose" form so that the compressed air will not impinge upon the surface of the metal to disturb it to any extent. The mold is also connected with an exhaust pump and the air is exhausted from it. By these devices the metal is forced into the mold which contains little or no air and oxidation and blowholes are obviated.

The use of the compressed air in the manner explained, avoids the employment of any metal pump as frequently employed in casting metals under pressure. Pumps of this nature must naturally be in the metal and are then subjected to the corrosive action of the molten metal with the result that they soon wear out.

A Skim-Gate for Making Sand Castings.

A new form of skim-gate for making sand castings has recently been patented by August Erlandson of Chicago, Ill. The gate is in the form of a sieve, which is inserted in the mold and through which the metal passes.

The skim-gate is made of a dry sand core and is inserted in a depression in the mold. This depression is made by a suitable pattern and is spherical. The dry sand core is then



New Form of Skim Gate.

inserted in the drag half of the mold. The cope half containing half of the spherical pattern is slightly smaller than the drag half so that, when the cope is placed on, the sand will force the dry sand core in the form of the sieve, down tightly so that it cannot float up when the molten metal strikes it.

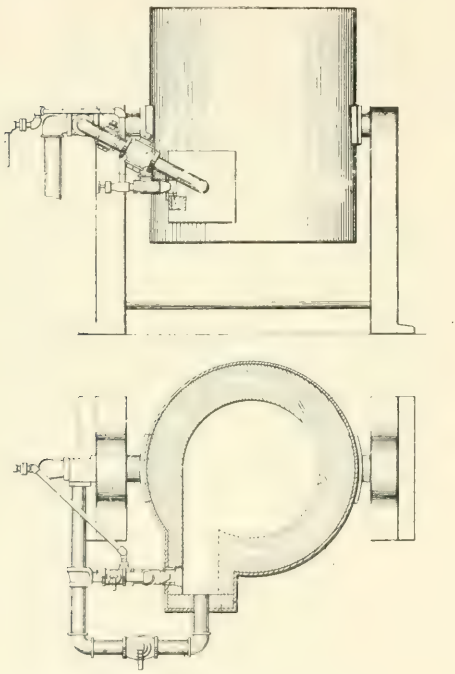
The dry sand core is made with small holes in it and the molten metal passes through it and the dross, dirt and other foreign matter are removed thereby.

Aluminum-bronze or manganese-bronze may frequently be prevented from shrinking on the heavy portions by the use of chills, but before adopting this method, a casting made in such a manner should be cut open. The chill often solidifies the surface first, leaving a shrink hole in the center of the casting.

An Improved "Steele-Harvey" Crucible Furnace.

The Monarch Engineering Co., of Baltimore, Md., have recently patented a modification and improvement in their well known type of "Steele-Harvey" crucible melting furnace. The furnace is herewith illustrated.

The invention relates more particularly to the method of burning the fuel and the oil, for which the furnace is intended, may be adjusted along with the air to a degree hereto-



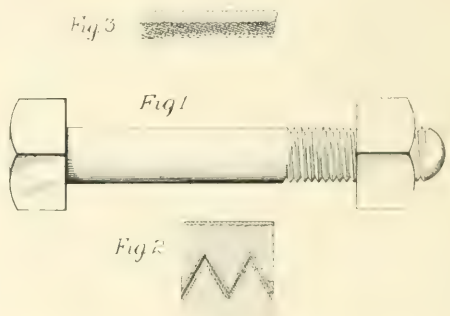
Improved "Steele-Harvey" Furnace.

fore not attained. The feature of the furnace lies in the use of an auxiliary air blast. The oil fuel is admitted to the furnace by means of a suitable burner and the force of the flame may be regulated by a needle valve. This burner uses an air blast and is, in fact, the regular burner manufactured by this company.

A cross-blast of air is then admitted to the furnace by a second and auxiliary pipe. A low pressure is used for this, when necessary, or a high one if desired. In this manner a more complete combustion of the fuel is obtained and the intensity of the heat is increased. By increasing or decreasing this auxiliary air blast, the heat may be regulated in an excellent manner. This blast is admitted so that it impinges upon the oil flame at a 90° angle and so breaks up the blast and supplies the air necessary for complete combustion.

Hot Galvanizing Bolts and Nuts.

In the hot galvanizing of bolts, nuts or other articles which have threads cut upon them, the zinc fills the threads so that they require re-cutting and this removes the zinc coating, leaving the iron or steel underneath exposed. In order to overcome this difficulty, Edward L. Watrous of the Edward L. Watrous Galvanizing Co., of Des Moines, Iowa, has devised and patented a process which allows the threads to be coated with the zinc in a uniform manner so that no re-cutting is necessary.



Sketch Illustrating Method of Galvanizing.

The process is quite a simple one. The bolts, nuts or other articles are galvanized by pickling and then immersing in molten zinc (after they have been dipped in chloride of zinc for a flux) and galvanized in the usual way. So far the process is the same as that regularly employed. When the articles have been immersed in the galvanizing kettle for a sufficient length of time to insure an even coating, they are removed and at once subjected to centrifugal motion which throws off the surplus zinc in the threads, leaving them coated in a uniform manner. The threads, therefore, do not become clogged with zinc and can be used in the same manner as though not galvanized at all.

The "Nonesuch" Plating Machine.

An improvement upon the well known "Nonesuch" plating machine has recently been made and patented by Seth C. Catlin* of Bloomfield, N. J. The machine is made with

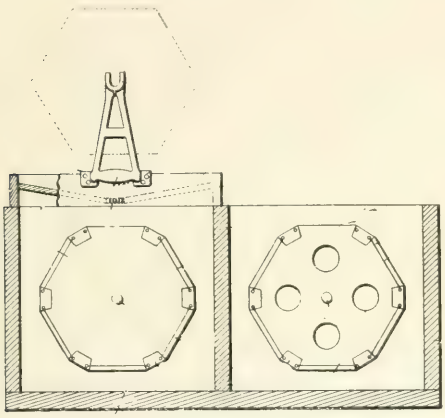


Fig. 1. Cross Section of the Machine.

two barrels in the tank which are revolved by suitable mechanism. These barrels are made with perforated staves which slide in and out so that the work may readily be removed. The panels are made of canvas to allow free circulation of the plating solution and yet retain the smallest work.

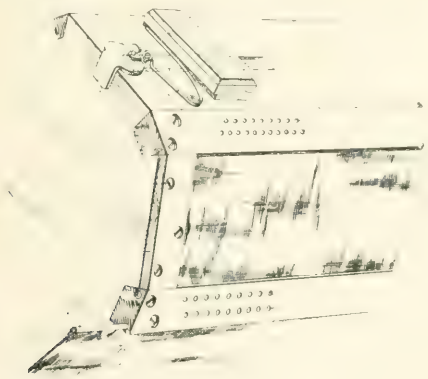


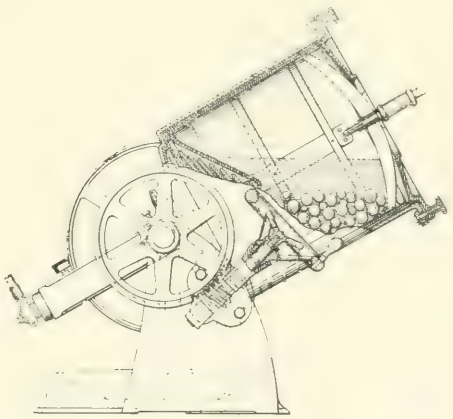
Fig. 2. Detail of the Barrel.

The barrel is removed from the tank by a lift and a tray placed under it into which the work is dumped. This tray is made with a perforated celluloid bottom so that the solution will drain back into the tank. The work remains in the tray and may be taken away from the plating tank and rinsed. The machine is now being manufactured by Rockhill & Vietor, 114 John St., New York City.

*Deceased.

A New Plating Barrel.

A new plating barrel of the oblique type has recently been patented by Marcellus Reid of Cleveland, Ohio. This barrel is herewith illustrated and the novelty of it lies in the use of a metal (steel) shell for the barrel itself. It has previously been found necessary to use wood for this purpose, on account of the con-



Reid's Form of Plating Barrel.

ductivity of the steel, comprising the shell of the barrel, being so great as to prevent the successful plating. The metal would deposit on this shell as well as on the work, and the solution, in some instances would attack it.

In order to obviate this the barrel is lined with hard rubber which protects the steel shell. The anodes are placed in the bottom of the barrel as shown and are of the "built-up" type, so that new sections may be put on when desired. The barrel is made to tilt.

For the majority of automobile castings in which aluminum is used, an alloy of 92% aluminum and 8% of copper is the mixture employed as this has been found the safest to cast. It rarely cracks in the mold while shrinking.

Questions and Answers.

QUESTION No. 1159. Is there any method that can be used for softening manganese-bronze. I am making small propeller-wheels from it and my customer claims that it is too hard and tough to machine. What I am using is as follows:

Copper	56 lbs.
Zinc (Bertha)	42 lbs.
Manganese Alloy	2 lbs.
Aluminum	4 oz.

There is also difficulty in polishing the wheels. The buff drags and leaves streaks. What can be done?

Answer What you desire in the manganese-bronze is the very thing to which it owes its existence. It is wanted hard and tough. You can, however, soften it if you want, by adding less zinc and some lead. Modify your mixture as follows:

Copper	56 lbs.
Zinc	39 lbs.
Manganese Alloy	2 lbs.
Aluminum	4 oz.
Lead	3 lbs.

This mixture, however, will not be as strong as the others, but it may answer the purpose. You apparently want a small wheel of moderate strength, and one that will cut easily. The mixture will give you such a wheel, but it will not cut as freely as good, yellow brass. You can soften it still more by taking less zinc.

QUESTION No. 1160. What is the difference between a rolled copper anode and an electrolytic one? We understand that rolled copper anodes are preferable. Why is this. We think the electrolytic ones would be better on account of their greater purity.

Answer. Rolled copper anodes are usually preferred on account of the fact that they dissolve away evenly and when they have served their purpose, they will be found very thin. Electrolytic anodes are good and present a large surface to the action of the current, on account of their very rough surface, but they do not dissolve away evenly and parts are apt to drop off in the solution long before they have worn out. For this reason, rolled anodes are as good as the electrolytic. It never gives any difficulty on this account.

QUESTION No. 1161. What is necessary in running a nickel solution to obtain a bright deposit? We understand that some concerns to not buff their nickel at all, but obtain a nickel deposit bright enough for ordinary purposes.

Answer. The necessary conditions in obtaining a bright nickel deposit are:

1. To have the work buffed to a high "color."
2. To have a good solution that works free from stain.
3. To use a weak solution.
4. To use a weak current and deposit the nickel slowly.

The following solution has been found to work well:

Water	1 gallon
Double Nickel Salts	4 oz.
Single Nickel Salts	½ oz.
Sal-Ammoniac	½ oz.
Boracic Acid	2 oz.

If this solution is used warm it works better. After the article has been completely covered, do not deposit any more on it as it will gradually become dead. Bright deposits are always light ones.

QUESTION No. 1163. We are experiencing trouble with our die-castings, used as parts of electrical instruments, and which are brass plated. The brass plate does not last long and comes off when polishing pastes are used. What is the cause of this?

Answer. Your difficulty lies in the fact that you are not putting on a sufficiently heavy brass deposit. In addition, however, zinc, which is the main constituent of die-castings, has the property of "absorbing" light brass deposits. We have seen a light brass deposit on zinc disappear within several months and it was not rubbed or even touched. This can be avoided, of course, by the use of heavier deposits and we recommend a heavy copper deposit first, after which the brass can be put on.

QUESTION No. 1164. What is the usual method of introducing phosphorus into metals? We have seen illustrations in books showing an inverted bell-shaped iron casting through which metal is allowed to run into the phosphorus. Is this the best method?

Answer. We have never seen an apparatus, such as you mention, used, although we have noticed it in books on metals and alloys. The method ordinarily used is by means of a graphite phosphorizer. This is a bell-shaped appliance made of crucible material and an iron rod is fastened to it for a handle. The phosphorus is inserted in the cavity and held in by a wad of paper. The whole is then plunged down into the metal. Graphite phosphorizers are made by all crucible manufacturers and in different sizes. Much experience is necessary in handling phosphorus.

QUESTION No. 1165. What is the cause of a brass deposit coming several different colors? I have a brass solution I recently made up and it first gave a nice, yellow deposit. In a short time, however, it began to change and then several different colors were deposited. These range all the way from copper to brass. Why the solution should suddenly change in this manner I cannot understand as I added nothing to it.

Answer Your difficulty lies in the fact that you have too little free cyanide in your brass solution. You will notice that when the color changes as you mention, your anodes have

coated over. If you clean them off you will discover that the solution will plate brass of uniform yellow again. The coating over of the anodes impedes the current so that the right amount does not flow through the solution. By adding more free cyanide you will be able to keep your anodes clean and maintain your brass deposit in a uniform color. Just how much free cyanide to add you will have to determine by trial, but do not add any more than enough to keep your anodes clean or you will deposit zinc.

QUESTION No. 1166. We desire to cast some iron rods in brass. These rods are one-quarter of an inch square and enter the casting about three inches. We have not been able to prevent blowholes forming around this chill. How can it be avoided?

Answer. The method generally followed in casting a chill in brass is to first heat it red hot and allow to cool. Then insert in the mold. Your blowholes come from grease or foreign matter on the chill which forms gas when the metal strikes it. Skin-drying the mold before the chills are placed in it is a good plan as it prevents moisture from depositing on the chill.

QUESTION No. 1167. Is it customary in the manufacture of silver plated cutlery to first nickel plate the steel before depositing the silver? We have heard that it is the best method.

Answer. There are a few manufacturers who first deposit nickel on their cutlery previous to silver plating, but others deposit the silver directly on the steel. The evidence seems to be much in favor of silver plating the cutlery direct by the use of two "strikes" before going to the regular silver plating solution.

QUESTION No. 1168. Is there anything that can be used in a silver solution to render the deposit dead white? I have occasion to use a silver solution for a dead white finish, but it is always yellow, particularly when lacquered.

Answer. There are several things that will cause a silver deposit to come yellow:

1. Too much free cyanide in the solution.
2. Too strong a current.
3. If white when deposited and yellow after lacquering, it indicates that the lacquer is unsuited for the work.

Which one of these causes is yours, will have to be found out by yourself. Very likely you are using a brass lacquer on silver. You should obtain a lacquer made particularly for silver work and which is white.

It frequently happens that a silver deposit will turn slightly yellow or have a slightly yellow tint when deposited, on account of the presence of a sub-cyanide of silver in the deposit. This may be removed by reversing the current for a few seconds and "backing-off" the silver from the deposit. With a good silver plate, however, unless a deposit of extraordinary whiteness is desired, this procedure is unnecessary as the ordinary silver obtained from a good solution is white enough.

QUESTION No. 1176. We recently melted a quantity of tin-dross over a good, hot fire, but find upon attempting to use the product that it has a very dead color. We wish you would inform us how we can remedy this dull color?

Answer. If you have not contaminated your tin with iron or other metals, it may be brightened by the use of phosphor-tin. Add about 1 oz. to 100 lbs. of the tin. If, however, it contains iron, as it frequently does when obtained from dross, you cannot purify it ecomonically unless special refining furnaces are used. As you have only a brass foundry, this would not pay you for the small amount you have. The tin can be used in making composition or other copper alloys without purifying, and we suggest this use.

QUESTION No. 1172. We have been having poor results with the refinishing of brass bedsteads. We take the lacquer off with potash and then give them the "Brush-brass" finish. After finishing and lacquering, the potash works out of the joints and seams of the tubing and spots it. We have not been able to overcome this, no matter how we do it. How can the difficulty be avoided and what is the best method of re-finishing the brass bedsteads?

Answer. You should keep the bedsteads out of potash or any similar cleaning solution. It soaks into the joints and seams and cannot be removed except with great difficulty. The best method is to take off the old lacquer, flyspecks and dirt by means of emery paste and a tampico wheel. This will leave the surface ready for the production of the "brush-brass" finish or for buffing. In this manner you will have no difficulty with spotting-out.

QUESTION No. 1173. Is there any brass or bronze mixture that can be used as a core and iron cast around it so that it will not melt. We have tried a mixture of the following metals:

Copper	80%
Tin	4%
Lead	8%
Zinc	8%

but the casting melts when the iron strikes it. We thought possibly there might be some mixture we could use that would not melt under these conditions.

Answer. We doubt whether you will find anything in the shape of a bronze or composition mixture that will answer your purpose if the amount of iron which surrounds it is quite heavy so that there is an opportunity for the bronze to heat up and melt before the iron cools. Iron melts at a much higher temperature than bronze so that you will readily understand that it will readily melt the bronze if the opportunity occurs. You might try the following which, if it does not melt, will answer for your valve (which we understand your casting is) in case it does not melt. The nearer you approach pure copper of course, the higher the melting point:

Copper	90 lbs.
Tin	6 lbs.
Zinc	4 lbs.

We doubt very much, however, that this will answer your purpose.

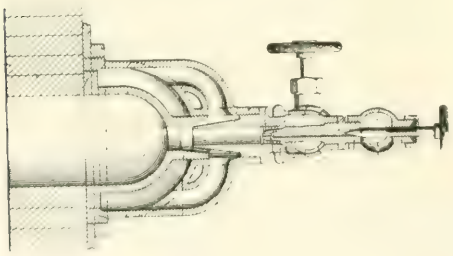
Patent Abstracts.

1,027,869, May 28, 1912. PROCESS OF SOLDERING SINGLE LINKS OF SOLID WIRE CHAINS. Fritz Maisenbacher and Theodor Bürck of Pforzheim, Germany. The process is applied to single links. The joint is cut in an uneven way and both ends of the

joint are moistened, while being cut, with a flux. A thread of solder is then inserted and cut off at the outside of the joint and the whole heated to fuse the solder. The feature of the patent lies in the manner of inserting the solder at the joint and the method of cutting it off.

1,028,305, June 4, 1912. MACHINE FOR REMAKING WIRE DIES. A machine for hammering and broaching the holes in steel or cast-iron wire dies.

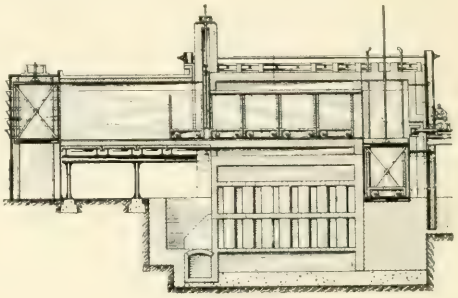
1,027,912, May 28, 1912. BURNER. Edward H. Schwartz of Chicago, Ill. Assignor to E. H. Schwartz & Son of the same city. A burner for burning fuel oil, the essential feature of



which is the injector action by means of which the oil is drawn into the burner. It is then gasified and mixed with preheated air and forced into the furnace. Steam or air may be used for the atomizing material.

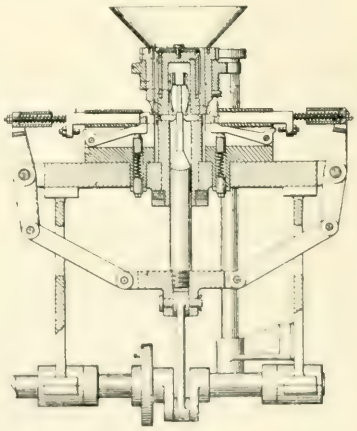
1,029,643, June 18, 1912. WATERPROOF PORTLAND CEMENT AND PROCESS OF MAKING IT. Maximilian Toch of New York City. A process of making Portland cement waterproof by first saturating Fullers' earth with lard oil, cotton-seed oil or other similar oil, and then subjecting to fumes of ammonia. This material is then added to the Portland cement. The Fullers' earth is treated in a tumbling barrel.

1,027,471, May 28, 1912. ANNEALING FURNACE. Hermann Gartner of Lintorf, near Dusseldorf, Germany. A furnace for the bright annealing of metals. The muffle is filled with inert gas, and by means of doors, which close the outside chamber, the metal is



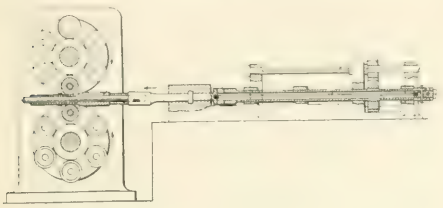
pushed into the muffle proper. The principle of the muffle is in the manner of inserting the metal, which may be on a truck or other suitable support. The insert gas may be illuminating or hydrogen gas or other similar material.

1,028,904, June 11, 1912. MACHINE FOR MAKING LINK MESH. Alphonso C. Pratt of Montclair, N. J. A machine for making the link mesh used for making mesh-bags and similar goods. The mesh is made from wire



and the principle of the machine is such that the operation is conducted automatically. The construction of the machine is best noted from perusal of the complete specification.

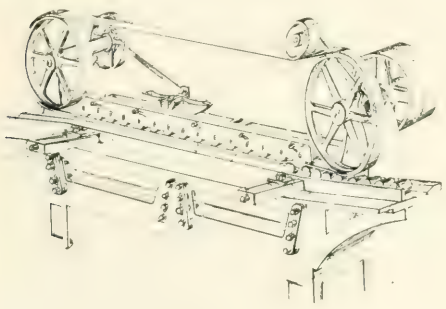
1,028,230, June 4, 1912. ROLLING MILL. Richard Ludwig of Bous-on-the-Saar, Germany. A rolling mill for rolling tubes from tube shells and which works in an intermittent manner. The principle feature of the mill is



in the use of a torsion spring mounted in a hollow driving shaft. One end of this spring is then connected with the mandrel holder and the other with the constantly rotating, hollow driving shaft. The tension may thus be adjusted as desired.

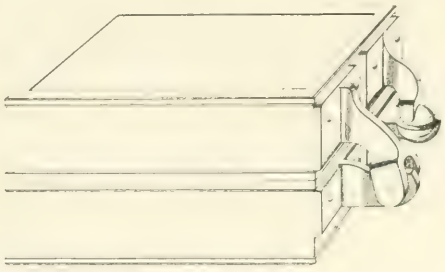
1,028,895, June 11, 1912. ELECTROLYTIC DEPOSITION OF METALS. Pascal Marino of Regents Park, London, England. An electrolyte for use as a plating bath for all metals. It consists of equal parts of sodium boroglyceride and sodium borobenzoate. These are dissolved in water. The solution is particularly useful for depositing on iron or steel surfaces, the inventors say. It is also claimed that the solution has oxide and scale removing properties and removes them while in the solution. The proportions of the salts used is not given.

1,030,225, June 18, 1912. MACHINE FOR SOLDERING SHEET METAL VESSELS. George H. Bennett of Sydney, New South Wales, Assignor to the British-American Tobacco Co., Ltd., of London. A machine for



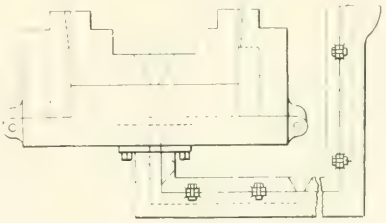
soldering the tops and bottoms of round tin cans. The cans are carried along by suitable mechanism and are soldered at the joints as they pass along by device which forces the solder to the joint.

1,028,603, June 4, 1912. FLASK FOR CASTING METAL BODIES. Edward Pipher of Port Hope, Ont., Canada. A flask for making sand molds in which the improvement is in the pins for holding the flask together. In molding with an ordinary iron flask, the ex-



pansion of the flask, when it becomes hot, is frequently sufficient to prevent the pins from entering, but in this new flask, the difficulty is avoided. The shape of the guides is the improvement.

1,030,198, June 18, 1912. CASTING APPARATUS. George F. McKee and William F. Schilling of Aspinwall, Pa. A mold for use in making castings, and which is intended



to be permanent. The mold is made of cast-iron or steel and is so designed that the metal may shrink naturally and the casting may readily be removed.

1,028,595, June 4, 1912. TIN OXIDIZING FURNACE. Konstantin Von Olszweski of Dresden, Germany. A furnace for oxidizing metallic tin with the formation of oxide for use in enameling, etc. The novelty of the furnace lies in the manner in which the air is admitted for oxidizing the tin.

1,028,303, June 4, 1912. SILICON PRODUCT. Frank J. Tone of Niagara Falls, N. Y. Assignor to the Carborundum Co., of the same place. This product of silicon is made in the electric furnace and is a solution of silicon carbide in silica. It is, therefore, a new compound and is made in a felt like fibrous form which has a high heat resistivity.

Trade Items.

The Acme Ornamental Iron Works has been incorporated in Los Angeles, Cal., with a capital stock of $10,000 to manufacture ornamental and artistic iron and metal work.

The Progressive Novelty Co., has been started in Attleboro, Mass., for the manufacture of metal novelties. Samuel Doesick is the owner and the factory is in the Ingraham Building, 54 Union St.

The Spencer Lens Co., of Buffalo, N. Y., manufacturers of spectacles and similar goods, have increased their capital stock from $30,000 to $250,000. A portion of the capital obtained will be used in enlarging the plant.

Baker & Co., of Newark, N. J., the well known platinum refiners and manufacturers of platinum ware, are to erect an addition to their works, 50x150 feet and two stories high. The plant is at 408 N. J. R. R. Ave.

The new plant of the Sterling Brass Co., 47th St., and St. Clair Ave., Cleveland, Ohio, has been placed in operation. The manufacture of a line of plumbers' brass goods will be carried on and the president and general-manager of the company is I. Herzbrun.

The Electric City Specialty Co., has been incorporated in Buffalo, N. Y., with a capital stock of $25,000 to manufacture stamped sheet metal and wire goods. A factory has been started at 161 Adams St., J. E. and I. E. Stark and J. H. Baer are the organizers.

The W. S. Rockwell Company, 50 Church St., New York City, manufacturers of furnaces for all kinds of melting, annealing, heating, brazing, etc., are sending out to the trade their Catalogue No. 9, describing the furnaces which they manufacture for light forging, tool dressing, and heat treating. This catalogue will be sent to those interested.

The name of the Eureka Tempered Copper Co., of North East, Pa., has been changed to the Eureka Company. The manufacture of cast copper commutators, commutator bars, trolley wheels, etc., is carried on and the company also conducts a brass foundry in which brass and bronze castings are manufactured. This company has been in business for many years and were the pioneer in the manufacture of hard copper catings.

The United Foundry & Machine Co., recently organized in Bridgeport, Conn., by Wm. C. Buckelew and others to carry on a jobbing brass foundry and machine business, has taken temporary quarters in the old Burnham foundry (South Main St.) and are doing a limited amount of work there. This foundry is being operated pending the building of their new plant in the East End of this city. The officers of the company are: President, William C. Buckelew; secretary, Philip D Beach; and treasurer, Andrew Steen of New York City. The directors are: William C. Buckelew, Andrew Steen, Philip D Beach, Frederick L. Buckelew and Geo. A. Helme.

A new plant is to be erected by the Dowagiac Stove Works of Dowagiac, Mich., stove manufacturers. This structure will be 126x250 feet and two stories high.

A new concern called the George E. Morton Company has been organized in Attleboro, Mass., for the manufacture of jewelry and metal novelties. The factory is located at 8 Angell St.

The Stanley Works of New Britain, Conn., manufacturers of builders' hardware, are to erect a large addition to their branch plant in Niles, Ohio and which will increase its capacity fifty per cent.

The plant of the Thompson Mfg. Co., of Newark, Ohio, manufacturers of hose-clamps, has been completed and in addition to this line of work, metal stampings will be manufactured. Galvanizing is to be carried on and the company has been capitalized at $35,000. The hose-clamp manufactured is patented.

Because of its resistence to corrosion, "Monel-Metal" is now being used in the manufacture of tanks for developing moving picture films. This material consists of nickel and copper and is being produced by the Orford Copper Co., 43 Exchange Place, New York City.

E. C. Hegman, for many years assistant treasurer of the National Cash Register Co., of Dayton, Ohio, and later secretary and treasurer of the Courier Car Co., has become vice-president and treasurer of the Dayton Plating and Mfg. Co., of Dayton. J. A. Keys will continue as president of the company, J. I. Pace as superintendent and Edward Burket as secretary.

The Autoyre Company has been organized in Oakville, Conn., and has purchased the plant formerly occupied by the Baird Company (now of Bridgeport, Conn.) and also the metal novelty business conducted by them. R. G. Stewart is the general-manager of the new company. The manufacture of small wire and metal goods, such as buckles, hooks and eyes and similar small goods is carried on. An electroplating plant is maintained.

The forty-first meeting of the National Electroplaters' Association was held in New York City on June 28th, and 26 members were present. Seven applicants were elected to active membership. The secretary of the Association announces that membership certificates suitable for framing are now ready and may be had by corresponding with him. A business committee was formed consisting of the Trustees, President, Past President, Recording and Financial Secretaries and the function of which is to transact all business so that members attending the meeting can devote their full time to subjects pertaining to plating and finishing. During the past fiscal year, 178 new members were elected. The next meeting will be held on July 26th.

A new plant is to be erected by the Automatic Register Co., of St. Louis, Mo. The present location is in the Pierce Building in that city.

An addition to the plant of the Lumen Bearing Co., of Buffalo, N. Y., is being made and will be used for aluminum casting work. This addition will contain 1800 square feet.

The name of the Regar Company of Cleveland, Ohio, manufacturers of plumbers' brass goods, has been changed to the Regar Brass Mfg. Co.

The Sibley Stove Co., has been incorporated in South Bend, Ind., with a capital stock of $30,000 to manufacture stoves. The organizers are I. A. Sibley, H. L. Greene, and N. C. Sprague.

The Davis-Bournonville Company, 90 West St., New York City, manufacturers of oxy-acetylene apparatus, have recently brought out a new appliance for cutting steel plates and which is called the "Oxygraph." This works on the principle of a pantograph and with it any desired design may quickly be cut with the blowpipe.

Benjamin Ogden, formerly works manager of the plant of the Otis Elevator Co., at Yonkers, N. Y., is now manager of the factory of the John Davenport Co., of Stamford, Conn., manufacturer of piano hardware. This company was formerly the Davenport & Treacy Co., and was recently absorbed by the John Davenport Co.

The chain department of the Oneida Community, Ltd., of Oneida, N. Y., has been sold to a new company formed to take it over. This new company is called the American Chain Co., and Lawrence Brown is the factory manager of the works. The manufacture of all kinds of chain is carried on and a small electroplating plant is operated. The manufacture of chain for the Weed Chain Tire Grip Co., is carried on at the plant.

The Franklin Silver Plate Co., has been organized at Greenfield, Mass. to take over the plant and business of the Warner Mfg. Co., of the same place. The plant will be enlarged and the business extended. The manufacture of silver plated flat-ware and cutlery will be carried on and high grade goods will be manufactured. The plant is at Nash's Mills and the officers of the new company are: President, G. C. Lunt; and treasurer, H. S. Dumont.

The Baltimore Tube Co., recently organized in Baltimore, Md., for the manufacture of brass and copper tubing, have purchased the seamless tubing plant of the Hawkins Co., South Britain, Conn., and will move it to Baltimore. The Hawkins Co., built a plant for the manufacture of seamless tubing, but never started to manufacture. This plant is modern and was designed by one of the leading experts in the Naugatuck Valley. The Baltimore Tube Co., are to manufacture seamless tubing and are equipping their plant with melting and annealing furnaces. This concern took over the Tube Bending & Polishing Machine Co., and is located on Bayard St.

The Cleveland Brass Mfg. Co., has been incorporated in Cleveland, Ohio with a capital stock of $150,000. Among the incorporators are M. F. Barnett and W. J. Smith.

The C. F. Church Mfg. Co., of Holyoke, Mass., manufacturers of bath room fittings and plumbing specialties, are planning to erect a new factory in that city.

The Specialty Mfg. Co., has been incorporated in Waterbury, Conn., for the manufacture of small metal goods and novelties. They are located at 23 Jefferson St., and A. F. Schwartz is the maaager.

The Telautophone Company, Ltd., has been incorporated in Winnipeg, Manitoba with a capital stock of $600,000 to manufacture telephone and telegraph apparatus. Roger P. Fournier is the general manager of the company.

The Berger Mfg. Co., of Canton, Ohio, are sending out an extensive treatise on "Metal Lumber" which describes the use of steel structural material in place of wood for building purposes. This book contains 112 pages and is illustrated with many reproductions of photographs of buildings in which their metal lumber was used.

A final divident of 10.75 per-cent. has been declared by the receivers of the Bannatyne Watch Co., of Waterbury, Conn., which makes the total dividend declared 37 per-cent. This concern started to manufacture a cheap watch and went into the hands of a receiver who decided to close the factory and sell the plant and business.

The George Zucker Company, 202 Emmett St., Newark, N. J., are one of the oldest manufacturers of polishing and buffing compositions in the United States and manufacture nothing but such products. They are makers of the celebrated "Acme White Finish" which they claim is superior to any other lime composition. They will send free sample upon request.

Something novel and new in the shape of a valve for high steam pressures has been placed on the market by the Patterson-Allen Engineering Co., 2 Rector St., New York City. This valve is made of forged steel and is tested to a uniform pressure of 1500 lbs. per square inch. A test of a 6 in. valve at 2000 lbs. per sq. in. showed no deflection. The use of forged steel for valves of this kind is a new departure as bronze or other non-ferrous alloys have always been used up to this time.

Charles F. L'Hommedieu & Sons Co., 24-30 South Clinton St., Chicago, Ill., the well known manufacturers of plating and polishing supplies and equipment, have recently issued a new and extensive catalogue of their products and which they are now sending out to the trade. This catalogue comprises 140 pages and is illustrated with excellent cuts of the various appliances manufactured. The catalogue also contains much useful information in regard to the uses of the various products found in the electroplating and polishing trades.

Manufacturing has been commenced at the plant of the Mauston Aluminum Co., of Mauston, Wis.

The name of the Leedin Novelty Co., of Newark, N. J., has been changed to the Leedin Silver Co., and silver plated toilet goods are manufactured. Turton Bros., are the proprietors.

Charles J. Lauter has started in the manufacture of platinum mountings at 47 Maiden Lane, New York City. Mr. Lauter was formerly of the firm of Brown, Jennings & Lauter of Newark, N. J.

The Buckeye Brass & Mfg. Co., has been organized in Cleveland, Ohio with a capital stock of $20,000 to manufacture plumbers' brass goods and brass specialties. The plant will be located at 1807 Columbus Road. This company succeeds the Buckeye Brass & Pattern Co., at the same address.

The Fairbanks Co., of New York City, have absorbed the Georgian Mfg. Co., of Binghampton, N. Y., manufacturers of steam valves and plumbers' brass goods. The Fairbanks Company are the selling agents of the E. & T. Fairbanks Co., of St. Johnsbury, Vt., the well known manufacturers of the "Fairbanks" scales. The manufacture of valves and similar goods will be carried on at Binghampton as before.

The Trenton Smelting & Refining Co., of Trenton, N. J., C. W. S. Munro, proprietor, are smelters and refiners of high-grade spelter and soft pig lead. The celebrated double-refined "Trenton" spelter is a product of this company. They also manufacture brazing solder for the trade. The plant is located at Canal and Pearl Sts.

The new plant of the Capital Wire Cloth & Mfg. Co., Ltd., at Ottawa, Canada is practically completed and Fourdrinier wires and wire cloth for paper manufacture will be manufactured. The output is to be exclusively for the Canadian trade. All members of the company were formerly connected with the Appleton Wire Works of Appleton, Wis. The officers of the Canadian company are: President, J. R. Buchanan; vice-president, Frank Haefs; secretary and treasurer, J. W. Perazzo; and superintendent, M. L. Peebles.

The "Crawford" sectional oven for lacquering, japonning, enameling or drying, is made with an enclosed gas-flame burner. This oven is manufactured by the Oven Equipment & Manufacturing Company, 981 Dixwell Ave., New Haven, Conn., and who have been making a study of ovens for manufacturing use for a number of years. The enclosed gas burner means that delicate colors can be baked in the oven without danger of change and that the air is free from deleterious products of combustion. The sectional feature permits of quick installation without re-inforcing the shop floor. Low fuel cost is one of the advantages of this oven and catalogues will be sent upon request. In addition to the uses enumerated, many others will be found by makers of metal goods.

A permit has been taken out by the Grand Rapids Metal Furniture Co., of Grand Rapids, Mich., for the construction of a new factory. The cost will be $12,000.

The T. B. Laycock Co., of Indianapolis, Ind., manufacturers of metal bedsteads, have gone into the hands of a receiver and the liabilities are stated to be $400,000 with assets estimated at $1,000,000. Charles E. Coffin is the receiver.

The plant and business of the American Cash Register Co., of Dayton, Ohio, manufacturers of cash registers, has been taken over by a new company called the American Register Manufacturing Co., and which has been capitalized at $600,000.

The factory of G. A. Schlechter of Reading, Pa., has been moved from 155 Penn St., to 636 Court St. The manufacture of jewelry is carried on. He will occupy the whole of the three story building. Badges are one of the specialties which he manufactures.

The White Plating Co., of Boston, Mass., have moved from 21 Bromfield St., to 364 Washington St. This is the location of the Boston office of the Woodman-Cook Co., of Portland, Maine, who recently discontinued their office in Boston.

The Baltimore Tube Co., successors to the Tube Bending & Polishing Machine Co., are now manufacturing automobile manifolds by electrodeposition. These complicated pieces of bent tubing have heretofore been made of copper tubing brazed together, but by this new process, the copper is deposited upon a wax core and the wax then melted out when the right thickness has been obtained.

The Cleveland Blow Pipe & Mfg. Co., 2096 West 3rd. St., Cleveland, Ohio, manufacture dust collecting systems for use on buff-wheels, polishing and emery wheels and which will remove all the dust from these appliances and prevents its reaching the workman. Scientific management now demands that a clean shop and healthy conditions be maintained, and when it is, not only better work resurts, but an increased output. Manufacturers who desire a modern dust collecting system should write to this company for particulars.

Attention is called to the use of cupro-titanium, an alloy of copper and titanium, for deoxidizing metals. Titanium has the advantage of being a very strong deoxidizing agent and can be used in the brasses, bronzes, pure copper and aluminum. In addition to its strong affinity for oxygen, titanium has the greatest affinity for nitrogen of any metal. Nitrogen gas is absorbed by metals from the air during melting, and the titanium removes it from the melted metal. Cupro-titanium has only recently been placed on the market, although titanium has been employed in steel for a considerable length of time. The Titanium Alloy Mfg. Co., of Niagara Falls, N. Y., are the manufacturers and the sales agent of the company is Charles V. Slocum, 1225 Oliver Building, Pittsburgh, Pa. The manufacture is carried out under the Rossi patents.

The Baltimore Tube Company of Baltimore, Md., recently organized for making seamless brass and copper tubes, are installing oil furnaces for their melting and annealing.

The Bay State Jewelry Company has been incorporated in Attleboro, Mass., with a capital stock of $1,000 to manufacture jewelry novelties. The incorporators are Frank Nolan, Albert Saart and Arthur E. Monroe.

An addition to the works of the Sangamon Meter Works of Springfield, Ill., is to made. This addition is to cost $12,000 and will be 48x128 feet. This company manufactures electric meters.

Potter & Snell, Deep River, Conn., manufacturers of small wire goods, such as hooks, curtain hardware, and similar metal specialties, are to build a new addition to their plant and which will be 41x150 feet.

The Merchant & Evans Co., of Philadelphia, manufacturers of tin-plate and babbitt-metals and solder, have secured a site in Wheeling, W. Va., and which will be used for a new plant to manufacture tin plate and other products.

The Maiwurm Aluminum Works has been incorporated in Erie, Pa., for the manufacture of aluminum cooking utensils. The incorporators are Paul Maiwurm, Julius E. Curtze and Dale Maiwurm. A plant will be equipped for manufacturing.

The Bridgeport Deoxidized Bronze & Metal Co., of Bridgeport, Conn., wish to purchase No. 1 red and yellow composition and brass turnings, and are in the market for large or small lots. This company are a very large consumer of this class of material and anyone who has these classes of material for sale will do well to correspond with them. Their terms are cash and the highest market rates are always paid.

The Craighead Plumbing & Electric Co., Richmond, Ind., manufacturers of chandeliers, are to move to a new building, the third floor of which will be devoted to the manufacture of chandeliers. In the rear of this room the polishing, plating and lacquering rooms will be situated. Individual motors will be used to drive the polishing and plating plant. This company also carries on plumbing, steam-heating, and electrical work.

The long experience of the Connecticut Dynamo & Motor Co., of Irvington, N. J., in the manufacture of electroplating dynamos will justify any manufacturer in purchasing their products. Their reputation has always been the highest. For many years they manufactured the dynamos sold by the Zucker & Levett & Loeb Co., and nearly 10,000 of them are in use. This company also manufacture a very complete line of motor-driven grinding, polishing and buffing lathes and also the "Rotoplater", the first mechanical plating machine and one of the most widely used. Other polishing and plating equipment is manufactured and correspondence is solicited and catalogue will be sent upon request.

The Mac Cordy Casting Machine Co., has been incorporated in Fabius, N. Y., with a capital stock of $25,000 to manufacture casting machines and metals.

The contract has been awarded for the erection of a foundry for the General Aluminum & Brass Castings Co., of Detroit, Mich. The cost will be $25,000.

The Manitowoc foundry of the Aluminum Castings Co., is to be moved to Milwaukee, Wis., on account of labor troubles in the former place. Sites are now being looked up.

The Miller Wire Cloth Co., has been organized at Worcester, Mass., with a capital stock of $20,000 to take over the Miller-Richardson Mfg. Co. Martin M. Miller is the head of the company and additional factory space has been obtained.

The Detroit Fuse & Mfg. Co., manufacturers of electrical specialties, is to erect a new building on Rivard St., near Harper Ave. This structure will be 54x110 feet, and two stories high.

The Detroit Lubricator Co., of Detroit, Mich., manufacturers of lubricators and brass specialties, have established a branch factory at Windsor, Canada and will erect a new factory there in the near future.

A brass foundry, in which aluminum castings will also be made, is being built by the Star Carburetor Co., of Detroit, Mich., manufacturers of automobile carburetors. The plant is located at 685 East Atwater Ave.

The Phoenix Hardware Co., of Homer, N. Y., whose plant in that place was recently destroyed by fire, has acquired the plant of the North Buffalo Hardware Co., at Buffalo, N. Y., and will move to that place. Hardware specialties are manufactured.

The E. Ingraham Company of Bristol, Conn., clock manufacturers, has purchased the plant and business of the Bannatyne Watch Co., of Waterbury, Conn., watch manufacturers, and which recently went into the hands of a receiver and was sold by order of the Court. The manufacture of watches by the E. Ingraham Company is a new departure, but a number of the other clock manufacturers have already been engaged in this line of work for some time. Cheap watches are to be made. The manufacture of the Bannatyne watches will be carried on in Bristol.

The Baird Machine Co., of Bridgeport, Conn., who recently moved into their extensive plant in this city report the largest sales, during the past month, of any in the history of the company. For about eight years it has been necessary for the company to run over time to keep up with orders, and has, during that time, maintained a night gang. Several times the capacity of the plant has been doubled until at the present time a very extensive factory is operated and one that is modern in every respect. This concern manufacture a large variety of presses, automatic machinery for small metal goods, and tumbling barrels for ordinary tumbling and steel ball burnishing.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.22
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia, 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.08⅛
Arsenic, Metallic	lb.	.10
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.50
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitrol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.10
Chrome-Green	lb.	.50
Copper, Lake (carload)	lb.	.17½
Copper, Lake, (cask)	lb.	.17¾
Copper, Electrolytic, (carload)	lb.	.17⅜
Copper, Electrolytic, (cask)	lb.	.17⅝
Copper, Casting, (carload)	lb.	.17
Copper, Casting, (cask)	lb.	.17¼
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (BlueStone)	lb.	.09
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Flour Spar	lb.	.01¼
Fusel Oil	gal.	3.50
Gold Chloride	oz.	11.75
Gold, Pure	oz.	20.87
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iridium	oz.	62.50
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04¾
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	1.16
Mercury, Metallic (Quicksilver)	lb.	.40½
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.40
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Satpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Cloride	oz.	23.00
Platinum Metallic	oz.	45.50
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic	lb.	.05½
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.08
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.61½
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin Metallic	lb.	.45¾
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc, Carbonate, dry	lb.	.19
Zinc, Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.07¼

THE BRASS WORLD AND PLATERS' GUIDE

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A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.

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Contents for August.

Aluminum, Flux for Soldering 292
Aluminum, French Method of Nickel Plating 291
Art Brass Wares in India, Manufacture of 291
Automobile Radiators by Electrodeposition 294
Blue Nickel, Notes on Plating With 284
Blowholes in Castings, Preventing 294
Brass and Bronze Plating Solutions 275
Brass, Cheap Blackening of 292
Brass Founders, "Casting-Up" on 293
Brass Foundry Mixtures, Standard 285
Brass Sheet, Crystallization of 289
Electric Welding and Application 277
Furnace for Melting Platinum, Electric 273
Lead-Oil, Manufacture of Synthetic 288
Graphite in Crucibles, Artificial 281
Graphite Deposits, Ceylon's 288
Grinding Wheels, Lubricating 295
Iron Pipes, Removing Scale from 295
Iron and Steel by Tungstate of Soda, Protecting . . . 272
Kindergarten Metallurgy 267
Leonic Ware in Bavaria, Manufacture of 284
Mercury, Demand and Use of 290
National Electroplaters' Association 294
Nitrogen on Metals, Effect of 276
Platers vs. Brass Founders in Spotting Out 293
Platinum etc., Volatility of 272
Sand-Blast and Its Value 269
Silver Deposits, Blistering of 287
Silver Deposits, Yellow 289
Silver Solutions, Ammonia in 284
Silverware, Cleaning 293
Solid Belts for Tumbling Zinc and Aluminum 274
Tripoli and Its Markets 279
Vanadium Alloys and Their Application 274
Zinc and Aluminum Wires, Rolling 290

Kindergarten Metallurgy.

Were our subscribers familiar with the details of metallurgy, we presume there would be no occasion to publish a technical paper; and we believe, therefore, that some of the questions we receive in this line of work are quite excusable. These queries are often amusing but we are pleased to answer them just the same, and do not wish our subscribers to hesitate to ask anything they desire to know and we will endeavor to reply to the best of our ability.

It is with the intention of instructing our subscribers that we are calling attention to some of the questions we have received in the past and are still receiving, and trust that it may result in the amelioration of many of those who are groping in darkest depths of non-ferrous metallurgy.

Oft-repeated inquiries have been for a soft solder of a yellow color that will melt at the temperature of ordinary soft solder. *There is none.*

Spelter and zinc are different names for the same thing and are used indiscriminately.

Many persons have inquired for a black metal, brought about, no doubt, by the fact that there are so many articles with black finishes used on them. There is no black metal, and if there was it would not be a metal for the reason that the very definition of a metal is that it shall have the property called "metallic lustre."

Much thought, time and labor (to say nothing of money) have been spent in an attempt to find a copper alloy, either a bronze, brass, or white metal that will rival gold and

platinum in non-corrosive properties. There is none. An alloy partakes of the property of its principal metal and this fact renders the pursuit useless.

Impurities in the brasses or bronzes do not cause blow-holes in the castings. In fact, they have the tendency to prevent them. In ninety-nine cases out of a hundred, they come from poor melting. Wet sand or hard ramming produce them in some instances but they are large and easily detected.

Scrap metals, if they contain the same ingredients, are equally as good as new metals. If not, they do not contain the same substances.

There is no metal as white as silver and it stands aloft in this respect.

There is no metal or alloy with a low melting point that is strong. It is a law of metallurgy that all strong metals have a high melting point, comparatively speaking. A strong, low melting metal would be a boon to those making die-castings, but there is none.

There is no metal that can replace tin in making composition or ordinary bronze, such as steam-metal. It is absolutely necessary and additions of other metals, in place of it, cause the metal to shrink to an extent that the casting of it becomes unprofitable. Attempts have been made to find a substitute for tin, but none has been discovered.

The Plater vs. the Brass Founder in the "Spotting-Out" Difficulty.

In many establishments plating or finishing brass castings, there is a constant controversy going on between the plater and the brass founder in regard to the difficulty of spotting-out. The spotting occurs after the castings have left the plater and he is usually blamed for it, and in order to protect himself, he attempts to lay the blame upon the brass founder who makes the castings. This results in a controversy which frequently becomes quite lively and ends in a veritable struggle for existence; so much so in fact that instances are not infrequent in which one or the other has been discharged.

Such a state of affairs is all wrong, and were the true facts appreciated, there would be no friction between the plater and the brass founder and matters would go along smoothly. As a matter of fact, the plater is more at fault than the brass founder.

Spotting-out occurs, as a general thing, on account of the plating solution, dip or pickle, penetrating the pores and imperfections of the casting, and then working out after finishing and corroding and spotting the metal around this cavity. Castings are the articles that cause the trouble as sheet metals are rarely subject to it. One would think, therefore, that this would be a matter for the brass founder to solve, and so it is, if he can do it, but so far he has been unable to offer any solution.

Castings may be made with the greatest care, the best metals used, and every precaution taken to render them as perfect as possible, but still spotting-out will occur. It is th "nature of the beast". All castings are more or less porous, and while now and then one may be produced that is free from it, it cannot be accomplished in the regular run of work, no matter how careful a brass founder may be or what metals are used. It is simply impossible to make perfect castings as a regular thing. The castings may have a *perfect appearance*, but they are *not* perfect; and all the brass founder can do is to make them look well and he should be well satisfied if he can do this.

The problem, then, is for the plater to solve and he must start with the assumption that the castings will spot out and make the endeavor to prevent it by treatment in plating. This is possible and is being done right along. A plater with many years experience in plating castings, recently informed us that he tried for many years to find the solution of the spotting-out difficulty in the brass foundry, but had not been successful, and had finally been obliged to overcome the brass founders difficulties which this individual himself is powerless to solve.

If the castings made in the brass foundry look well and polish or buff with a good surface, then it is a matter for the plater to solve, for the castings will surely spot out if not given the treatment necessary to prevent it. We take pleasure, therefore, in exonerating the brass founder who would gladly obviate the trouble were he able to do so. The plater must make the "best of a bad job."

Zinc chloride is the best flux for use in melting aluminum and aluminum alloys. It removes the dross and produces clean metal. A small amount is thrown on the surface while the aluminum is melted and the whole stirred.

The Sand-Blast and Its Value In Preparing Brass Castings for Market.

There is no one appliance used in the brass foundry that has had such a welcome as the sand-blast. This is particularly true of the brass foundry where many of the large appliances used in the iron foundry for molding, melting and handling of castings cannot be employed on account of the limited amount of work and its small character. The sand-blast, however, is not one of these appliances and has always found a warm reception in the brass foundry trade where it has proved of the utmost value.

In the brass foundry, the castings are made in sand, almost entirely in green sand without any coating on the face of the mold. When the molten metal strikes this sand, a fluxing action takes place and there results a skin of fused material on the surface which is hard and takes the edge from a cutting tool. It is this skin or surface of sand that is responsible for the employment of the sand-blast in the foundry.

All castings do not have a surface of fluxed sand on them and this is particularly true of the brasses and bronzes containing aluminum. The presence of aluminum gives a smooth surface to which the sand does not adhere. Were this class of castings the only ones made in the brass foundry, then there would be no need of a sand-blast in this trade. The castings which give the most trouble on account of sand adhering to the surface are the so called tin bronzes, and the phosphor-bronzes. Any mixture containing tin (and, of course, free from aluminum) seems to have the property of fluxing the sand so that a hard, flinty skin is produced.

Method of Using Sand-Blast in Sand-Blasting Castings.

It is in the removal of this adhering sand that the sand-blast is valuable. Pickling or dipping in acid will not remove it unless hydrofluric acid is used and then it does not leave the surface particularly satisfactory. With the sand-blast, however, the sand that has been fluxed on the surface, no matter how

hard, is removed rapidly and the surface left in an ideal condition.

The sand-blast used for the purpose is preferably of the type in which the sand is returned to the hopper and used over again. This, however, is not imperative, but it renders the operation much easier and more rapid work can be produced. The air pressure should be rather high in order to obtain rapid results and from 30 to 50 pounds allow quick work to be performed. Air is now the universal medium for driving the sand and has supplanted steam, used when the sand blast first came out, almost entirely.

Unless the castings are small, they will have to be treated by hand and this is a very satisfactory method as it allows careful working and the uniform blasting of the entire surface. If castings are to be sand-blasted, it is quite essential that the whole surface should be treated and not leave a portion of the surface untouched and with the sand adhering to it. The illustration shows the manner of sand-blasting castings by hand.

The sand used in the sand-blast for sand blasting brass or bronze castings can be ordinary sharp sand obtained from any sand bank or sea-sand from the sea-shore. Which ever is used, should be dry and riddled to remove any stones or other foreign matter that would obstruct the nozzle of the sand-blast.

Those who use a sand-blast for treating brass castings will be surprised at the fine surface left. In selling brass castings, appearance counts for much and that of a sand-blasted casting leaves nothing to be desired. The surface is clean and uniform in color. It is much superior to a dipped surface as it is not apt to tarnish. Dipped castings are chemically clean and the surface is in an ideal condition for tarnishing. Soon after dipping, therefore, the metal begins to spot and stain, leaving the casting in a more unsightly condition, perhaps, than it was at first. Not so with a sand-blasted surface. There is no more liability to tarnish than with the casting in its original condition.

The advantage of a sand-blasted brass or bronze casting is twofold:

1. The appearance is greatly improved and in the eyes of the customer it is of better grade than before sand-blasting. This is particularly true of the cheap grades of scrap metal which do not cast as well as those made of new metals.

2. The machining of the casting is accomplished with greater ease and certainty. There is no sand to take the edge from tools and the necessity of a preliminary roughing cut to remove the sand is obviated. The advantage of such a surface is particularly noticeable in the case of automatic tools used in machining the brass. Sand on the surface of the castings greatly injuries these and it is expensive to sharpen and adjust them. With sand blasted castings there is no danger in this direction and the machining can be accomplished with the greatest ease.

In connection with the appearance of the surface of a sand-blasted brass casting, it may be said that it will frequently puzzle those who are not familiar with it. It often has the appearance of a special finish and has puzzled many brass founders to know how his competitors are producing it.

The Effect of Nitrogen in Increasing the Electrical Resistance of Metals.

It is only quite recently that the effect of nitrogen on metals has been appreciated. A difficult element to detect in metals by chemical analysis, it has, in the past, escaped notice, but it is now known that some metals absorb it eagerly. Its effect on steel has been studied, and it now has been shown that it is instrumental in lowering the strength of aluminum. There is no doubt that nitrogen has far more influence on metals than usually supposed.

Nitrogen is a gas and exists in the atmosphere. When metals absorb it or take it up, it becomes a part of the whole and, in reality, forms a sort of alloy. This absorption is called *occlusion.*

A marked effect of nitrogen on metals has recently been indicated in the case of metallic tantalum, now used for making electric lamp filaments. Pure tantalum before treatment with nitrogen gas has an electrical resistance of 65 ohms, but after heating for one minute in an atmosphere of nitrogen under a slight pressure, the resistance is increased to 240 ohms. The filament burns with equal brilliancy and on account of the increased resistance, a thicker filament can be used.

The marked increase of over 70% is of much interest and it is probable that a tantalum nitride is formed during the heating.

The Use of Soap-Bark for Tumbling Zinc or Aluminum Goods.

Those who attempt to tumble zinc or aluminum goods in the same manner that brass or even steel is tumbled, usually get into difficulty. This is particularly true in the case of steel balls where a soap of some kind must be used to lubricate them. The use of the same soaps that will work exceedingly well on brass or steel, will leave the zinc or aluminum articles dead and without any lustre, and also black in many instances if the conditions are right. At any event, the method that is used in tumbling brass or steel cannot be employed on zinc or aluminum.

Zinc and aluminum have many chemical properties that are similar, and one of these is the fact that they are both acted upon by alkalies. The stronger the alkali the more rapid the action. Aluminum is more rapidly attacked than zinc, but either are readily dissolved by a strong solution of caustic potash or caustic soda. All alkalies act upon them to a greater or less amount. The milder the alkali, of course, the less the action, but there is, nevertheless, an action that takes place.

In tumbling aluminum or zinc goods, therefore, with soaps, there is always a greater or less action, depending upon the amount of free alkali in the soap. Even with the so-called neutral soaps, this action takes place for the reason that neutral soap is really alkaline and it is impossible to make one that will not show this reaction. Whatever the soap is, therefore, there is a slight action in tumbling the zinc or aluminum goods and this is sufficient to render them dull and to blacken them. The difficulty, then, is in the soap.

It has been found that soap-bark can be used in tumbling zinc or aluminum goods with excellent results and it is employed at the present time in a number of establishments making small goods of these metals with the best of success. In Fig. 1 is shown some zinc eyelets, made of sheet zinc, and tumbled with soap bark so that they had a high polish.

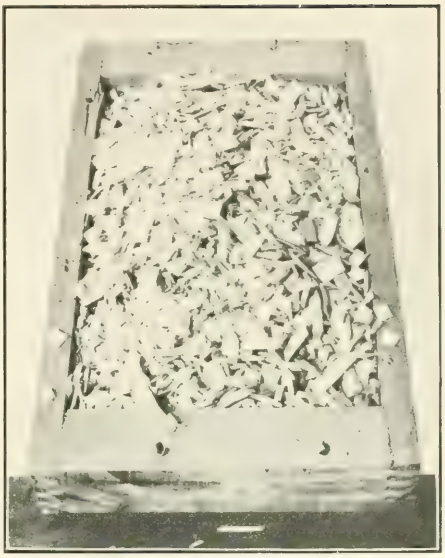


Fig. 1. Soap-Bark Chips.

Soap-bark is a vegetable material in the form of chips which have all the appearance of ordinary wood chips. It has a slightly alkaline reaction, however, and it is this that imparts the lubricating property to it, and allows its use in tumbling zinc or aluminum goods.

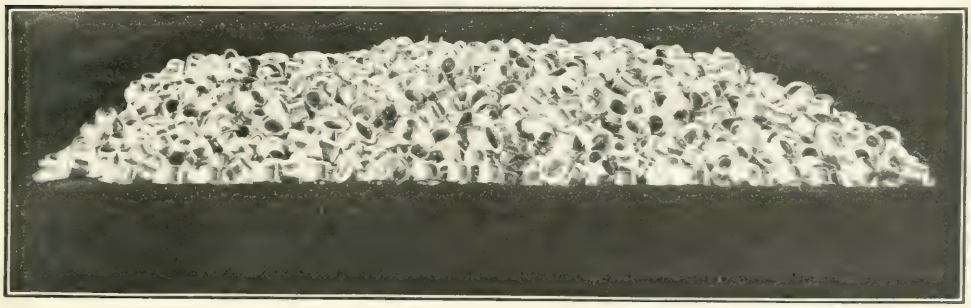


Fig. 2. Zinc Eyelets Tumbled with Soap-Bark.

The soap-bark is placed in the tumbling barrel with the goods and used in the same manner that soap would be employed. Either steel balls can be used or the goods can be tumbled without them in case it is possible to tumble in this manner.

Volatility of the Rare, Noble Metals.

Sir William Crookes in the *Proclamation of the Royal Society* publishes his results on the volatility of the rare, noble metals including platinum. These metals were heated below their melting points for some time, from 20 to 30 hours, and the effect noted. The results obtained are as follows:

Platinum	30 hrs.	0.245%
Iridium	22 hrs.	7.297%
Palladium	30 hrs.	0.745%
Ruthenium	8 hrs.	25.000%
Rhodium	30 hrs.	0.131%

The effect of the heating was as follows: The temperature used was 1300° C. The platinum had not sensibly changed in appearance. The palladium has lost its polish and had become crystalline and mottled, and the iridium showed the same effect. The rhodium was darkened, but did not become crystalline. The ruthenium became dull black and was coated with oxide.

The results of these experiments seem to indicate that platinum when free from iridium will stand heat better when used in the form of platinum laboratory utensils. Experience has also demonstrated this fact and it has been found that pure platinum crucibles last long and do not show signs of becoming crystalline and brittle like that of a platnum crucible that has been heated for some time. Pure platinum in the form of a crucible will stand heating for years without showing any sign of cracking or becoming crystalline; but a crucible made of platinum and iridium, particularly if the iridium contained in it is considerable, will shows signs of deterioration within a year or less. The bottom of the crucible becomes dark and gray and finally the metal becomes crystalline and cracks.

Sir. William Crookes states that the volatility of the metals, particularly in the case of ruthenium and iridium, is due to the formation of oxide, as these metals become blackened. When heated in a vacuum, the loss, in the case of these two metals was extremely slight. Platinum and rhodium, however, appear to volatilize as metal.

Tripoli and Its Markets.

Until recently the polishing earth known as tripoli has been imported into Germany from Italy, France, and Seneca, Mo. Lately the mineral has been found in Germany, and the price for German tripoli averages 5 marks per 100 kilos ($0.54 per 100 pounds), at which price it is displacing American earth, which commands about $0.86 per 100 pounds.

Earths of a pink and yellow tone are found on the market, the former shade being preferred, and are sold either once or twice ground, the trade expression being "O. G.," or "D. G." This material is shipped in sacks containing 100 pounds and is employed in the metal-polishing trades, to a small extent in the glass-polishing industry, for the manufacture of polishing wheels, and in the production of polishing creams. The entire business is not very important. One informant speaks of present prices being depressed in consequence of over-production.

German statistics include tripoli earth and pumice stone under one heading and therefore convey no satisfactory impression of the volume of business transacted.

The total imports amounted to 9,659 tons in 1911, as against 7,446 tons in 1910; the imports from Italy alone amounted to 8,757 tons in 1911, as compared to 6,155 tons in 1910. The duty is 2 marks per 100 kilos ($0.216 per 100 pounds). The exports amounted to 22,075 tons in 1911 and 7,643 tons in 1910, the Netherlands, receiving 15,877 tons in 1911 and 4,308 tons in 1910. The United States imported 293 tons in 1911 and 321 tons the year previous.—*Daily Consular Report.*

Protecting Iron and Steel From Corrosion by Tungstate of Soda.

Gilbert Rigg of the New Jersey Zinc Co., has discovered that tungstate of soda has the property of preventing the rusting of iron and steel and cites an instance in which bright articles of these metals were immersed in a solution of 1 part of tungstate of soda in 2000 parts of water and maintained their brightness for a long time.

In practice this method is applied to zinc oxide paints and instead of the tungstate of soda, a tungstate of zinc may be used with good results. This is ground with the paint and the fact that a tungstate is present is claimed to suffice as even the tungstate of zinc has the property of yielding to water and thus acting as a protection to the iron or steel

A Small "Hellberger" Electric Furnace for Melting Platinum.

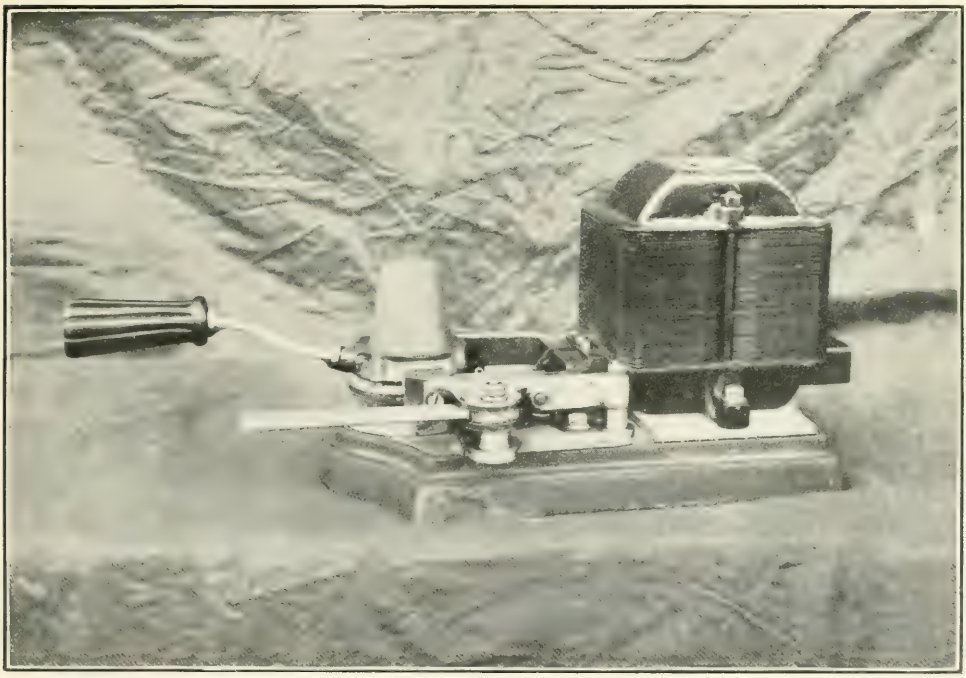
The extensive use of platinum in the manufacture of jewelry and in the electrical trades, has created a demand for a furnace in which it can be melted. The ordinary method of melting it, and one that has always been used, has been to hollow out a block of lime and melt the platinum in it by means of the oxy-hydrogen blowpipe.

A new form of small furnace for melting platinum has recently been placed on the market by Hugo Hellberger, Munich 41, Germany, the well known manufacturer of electric transformer furnaces for melting metals of all kinds. This small furnace is especially adapted for the melting of small quantities of platinum, gold or silver and their alloys as well. It will melt platinum up to 50 grams charges in a rapid manner and in a graphite crucible.

The furnace is made with a removable crucible so that it can be readily poured into a mold. The handle is used for this purpose and the casting of the metal then becomes simple. An ordinary direct electric current of 110 or 220 volts is used, and by means of the transformer at the rear of the furnace, is transformed so as to become available

The crucible is the ordinary graphite type, used for melting metals, but is treated with a special preparation supplied by the manufacturer of the furnace (the formula of which is given) so as to render it conductive. The metal is then melted in the usual manner by placing it in the furnace and starting the furnace by allowing the electric current to pass.

Ordinary graphite crucibles require only the preliminary treatment with the material to allow the melting to take place, and no special apparatus, therefore, is required.



The "Hellberger" Electric Transformer Crucible Furnace for Melting Platinum.

The furnace herewith illustrated is the smallest manufactured by the aforesaid maker, but many other sizes are also made and of varying capacity. They can all be used for the melting of platinum as well as other metals.

The amount of current required for melting platinum is stated by the manufacturer to be 10 kilowatt hours for melting 1000 grams of platinum.

Vanadium Alloys and Their Application to Non-Ferrous Metals.

By C. Powell Karr.*

In the manufacture of castings of non-ferrous metals of all descriptions foundrymen have endeavored to perfect the execution of their work by producing a product which shall be free from all kinds of impurities.

Among these impurities may be mentioned the various oxides, sulphides, carbides and nitrides of the constituent metals. To this end various fluxes, some of them adapted to brass, bronze and antifriction metals, others to special metals such as Monel metal, German silver, fusible alloys and other metals too numerous to mention, have been applied.

The character of the furnaces used for special work has been taken into serious consideration. Methods of charging the furnaces in various ways have been tried, some of them approved, some of them hopeless. Advice as to the methods of melting, adding the charge, bringing the mass to a heat, stirring the metal so as to promote a more uniform mixture of the composition and warnings as to overheating, "soaking" of the metals and other precautions have been given until the foundryman has become bewildered by the hedges built up around him in the metallurgical practice.

Fluxes of every description have been urged upon him to remove first one kind of an impurity and then another. So far has this gone on that various special fluxes are on the market with claims to remove every possible impurity that the charge is subject to by the products of combustion and by the unskillful handling of the melter. It has been claimed that fluxes of one kind or another depending upon the character of the alloy it is applied to will enable the founder to forget all the difficulties that encompass him from day to day and enable him to produce castings that are sound in every respect, that is, free from porosity or blow holes, castings that have a smooth skin, a close texture, that machine well, that will dip well, and finally that will pass the dreaded ordeal of the pump.

But when any of us come to apply any of these wonderful fluxes to such a metal as brass, for instance, we find that it is true that the right kind of flux will take out the dirt, the dross, the minute specks of iron, etc., and that we are able to run them off into the slag and that in the end we have a fairly clean metal, one that will pour well, fill the mold as it should be, have the proper shrinkage, and a good clean skin free from scabs, sand holes, hard spots, liquation, segregation and other disastrous occurrences, and sometimes we get castings that will pass triumphantly through the machine shop, show up a good color, texture and escape condemnation at the pump, but this chain of circumstances is the exception and not the rule.

Let but the slightest relaxation set in as to the founder's vigilance in watching every step of the operation, then chaos will begin. Should one ask any foundryman if he knows of any flux that will remove blow-holes, cavities, general porousness, and stop segregation, he will frankly admit that he knows of none, and this is true; there are some fluxes which will aid the foundryman in removing the dissolved or suspended oxides, but there are really none that will remove the various occluded gases that cause the blow-holes, gases that fill the cavities of the metal and create porousness.

There are some metals like aluminum that will remove some of the occluded gases up to a certain temperature, not high enough, as a rule, for brass and bronzes, but beyond that temperature they fail. There are some that have a strongly deoxidizing power, like manganese, with inherent properties that develop weaknesses in other respects, but not the power to break up, dissociate and eliminate occluded gases.

There are some metals that are capable of displacing the one gas nitrogen under special conditions, like boron and titanium, but at temperatures too high to be available with alloys like brass or bronzes. It is difficult to dissolve the latter metal in the proper alloy for introduction as a deoxidizer, and its use is accompanied by a considerable loss. Zirconium is a metal having great affinity for oxygen, but none for nitrogen; like titanium it has a low specific gravity, which lessens their capacity for the formation of alloys.

Molybdenum has a high oxidizing and desulphurizing power at low temperatures, but has no power to expel nitrogen nor carbon monoxide at high temperatures.

As to vanadium, it is stable at the ordinary

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atmospheric temperatures, while at red heat it absorbs oxygen with the greatest avidity; in fact this avidity for oxygen is one of its chief characteristics. It is a pentavalent metal and forms five compounds with oxygen, analogous to the oxides of nitrogen. Hydrogen or carbon monoxide will attack the vanadium pentoxide and reduce it to the trioxide, which has in that state great avidity for more oxygen and back again for more hydrogen and monoxide, so that these reactions go on in a cycle until all of the vanadous gases are used up. At the temperature of molten copper any vanadized alloy will almost at once be dissociated into its elements of vanadium and the metal with which it has been alloyed, thus exposing the vanadium to the attack of any oxides or nitrides that may be present in a gaseous form.

It is only by the avidity with which vanadium in the form of a vanadium alloy, as soon as dissociation sets in, seizes upon all of these gases, such as oxygen, nitrogen and hydrogen and carbon monoxide by its power to expel them while the charge is still molten that its great purifying effect is performed.

Efforts are now being made to prepare various suitable vanadium alloys, such as cupro-vanadium, lead vanadium, alumino-vanadium, nickel vanadium and cupro-manganese vanadium so that they can be properly introduced in correct foundry practice to enable the founder to eliminate these troublesome gases at will.

In no respect would such a preparation be a substitute for the fluxes now in everyday use, for while the latter will remove the coarser and commoner impurities the function of the vanadium products will be to supplement the work of the fluxes and reach the gases upon which no flux has any reaction.

Cast-iron floor-plates are the most satisfactory for a floor of a brass casting shop or a brass rolling mill floor. They are not injured by heat and stand the abuse that is given a mill floor without the damage that would result to concrete or similar material.

Rust on iron or steel goods may be very easily removed if the goods are first soaked in a hot caustic soda or hot caustic potash solution. This softens the rust so that it is much more rapidly and effectually removed by the acid pickle.

Brass and Bronze Plating Solutions and How to Make Them.*

Eighth Paper.†

Use of Arsenic

Arsenic is used in a brass solution to produce a bright and smooth deposit. When the brass bath contains it, it is known as a "bright brass" solution and the deposit a "bright brass" deposit. It is quite extensively used in brass plating solutions and has no advantage other than producing a bright deposit. Why arsenic should have this brightening effect is unknown, but the fact remains that it produces such an effect.

Beginners or those who do not understand a brass solution thoroughly, had better leave out the arsenic until the art of running a brass bath is mastered. It complicates the solution, of course, and if overdone, harm results.

The amount of arsenic necessary to produce the bright effect is quite small and the white arsenic (arsenious oxide) is used. This cannot be added directly to the brass solution for it will not dissolve, but will remain in suspension and do no good. It must be dissolved in some dissolving agent and when in solution, added to the brass bath. Some platers prefer to dissolve the arsenic in cyanide and this is satisfactory, but caustic potash or caustic soda is better for the reason that the arsenic goes in solution more readily and there is no gas given off, as there is when cyanide is used for dissolving it.

Caustic potash is the most satisfactory and is recommended for the purpose. The amount used of this potash solution of arsenic is so small that the potash has no influence on the brass bath. A good quality of caustic soda may also be used in place of the potash if desired and the same amount as that of the potash can be taken.

The arsenic solution is made as follows:

Water	1 gallon
Caustic Potash	1 lb.
White Arsenic	8 oz.

The white arsenic should be powdered and its purchase in this condition is always advised. To powder lump white arsenic means that

*Continued from THE BRASS WORLD, July 1912, page 244.

†These papers will be continued.

more or less is inhaled with its accompanying danger. Those who make a business of powdering it have a special apparatus for it. The powdered material can always be obtained and costs no more than the lump.

The potash is dissolved in the water and then the powdered white arsenic introduced. The whole is warmed and the arsenic will go into solution. If not warmed, it will also dissolve, but more time is taken.

The solution thus obtained of the white arsenic in the potash solution should be kept as a stock solution for adding the arsenic to the brass solution. It will keep indefinitely if retained in a well corked bottle. Do not use a glass stoppered bottle for the potash will cement the glass stopper, after a time, so that it cannot be removed. A good cork is the best for stopping the bottle.

The amount of arsenic required (arsenious oxide) in a brass solution for producing a bright deposit is from 1 to 2 oz. to each 100 gallons of solution. To obtain this amount of arsenic, it will be readily appreciated the following table will indicate just how much of the potash solution will have to be used in order to obtain a given quantity of arsenic.

Solution		*Arsenic*
1 Qt.	=	2 oz.
1 Pt.	=	1 oz.
8 oz.	=	½ oz.
4 oz.	=	¼ oz.
1 oz.	=	1-16 oz.

Let us suppose for example, that a 50 gallon solution of brass is had and that it is desired to introduce 1 oz. of arsenic. One pint of the potash solution is, therefore, necessary.

The potash solution of arsenic is added to the brass solution and the whole thoroughly mixed. The plating is then conducted in the usual manner. The best method, in case the amount necessary is not understood, is to add it in installments and try on some work. As soon as the deposit comes bright, no more should be added. An excess of the arsenic will cause the brass to become pale and off color and a very large amount will produce a gray deposit.

The arsenic in a brass solution does not remain in it for any length of time but gradually works out and fresh potash solution (containing the arsenic) must be added to make it up. If a solution is worked very "hard" it may require replenishing with arsenic every day, but if not, then it may run a week. The plater will have to watch his deposit and determine by its appearance whether it needs any more arsenic, and if it does, it is a simple matter to add the potash solution containing it.

The advantage of a bright brass deposit is really greater than many platers suppose. It saves cutting down in buffing and for this reason, a light deposit can be used where with a dead brass deposit, the buffers would cut through on the edges. With the bright brass a light touch to a buff wheel and a high "color" is obtained without any danger of cutting through on the edges or "high-lights". In addition to this fact, there is the advantage, for many classes of goods, of not being obliged to buff the brass at all, but it can be left in the condition it came from the brass plating solution. It is usually bright enough for many purposes and no buffing is necessary.

The Manufacture of Synthetic Fusel-Oil.

In a lecture before the Society of Chemical Industry in London, Prof. W. H. Perkin of Manchester University, described a process for making rubber synthetically and which has been widely commented upon in technical papers. This process involves the manufacture of fusel-oil as a raw material from which rubber is produced and in this connection the metal trades will also be interested for the reason that fusel-oil is an essential ingredient in the manufacture of lacquers.

In order to produce rubber commercially it was necessary, it was stated, to discover a cheap source of isoprene. Coal, petroleum, wood, sugar, and starch were considered. Finally starch from grain or tubers was chosen at a price of less than a penny (2 cents) per pound, and it was found that isoprene could be readily obtained from fusel oil, which is a by-product of ordinary alcoholic fermentation of starch. It was indispensible also to discover a cheap way of making fusel oil, and after a year and a half, it is claimed, a process has been disclosed which will enable fusel oil to be produced at $170 to $218 per ton, as against a normal market price of about $681 per ton. This discovery will prove, it is believed, of great importance in the manufacture of celluloid and artificial leather, and in other industries.

Electric Welding and Its Application to the Metal Trades.

It has long been known that all metals may be melted by passing an electric current of sufficient quantity through them and this fact is the base of the electric welding process. It remained, however, for Elihu Thompson, the inventor of the Thompson-Houston arc lighting system as now found in practically every community where electric lights are used, to make the application of this fusion in the electric welding of metals. The result of his early experiments and work in this direction has been the evolution of the electric welding machine and which is now so extensively used in the manufacture of iron and steel and non-ferrous metal goods.

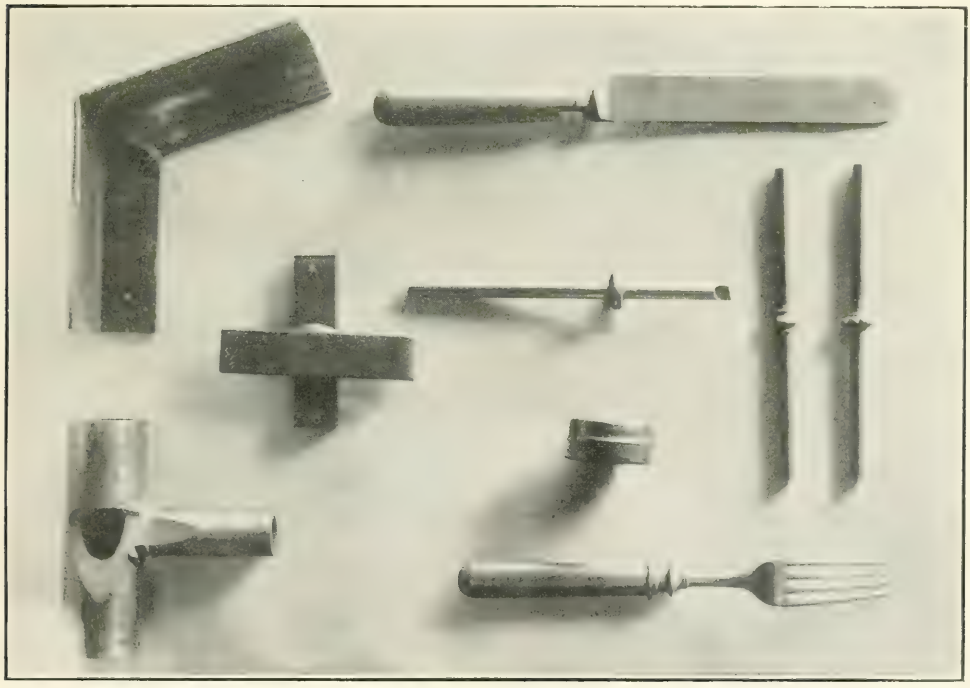


Fig. 1. Articles of Steel Electrically Welded.

The theory of electric welding is simple. A current of low voltage and high amperage is caused to pass through the metal. The resistance offered to the passage of the current heats the metal at the junction of the two pieces to be welded so that they melt. When it occurs, the pieces are forced together by a mechanical device which produces the weld. In other words, the metal is actually melted and then forced together, just the same as it is in the welding of iron or steel, except in the latter case, an actual melting temperature is not produced. In electric welding the actual welding heat is not that of melting but rather that of plasticity, so that ordinary welding and electric welding are really analagous and differ only in the source of heat.

In electric welding an alternating current only is used. A direct curent will not answer the purpose, and in case this is had it must be transformed into the alternating current. This is easily brought about by the use of a transformer. The alternating current employed is from 40 to 60 cycle between 100 and 500 volts. Those who install a generator and do not intend to purchase current from a central station, should obtain an alternating current generator as this will obviate the need of a transformer.

The welding of metals by means of an electric welder is very simple and can be ac-

complished by unskilled labor. This very fact should render it attractive to manufacturers and those who have never investigated the advantages of the machine will be surprised at the results that can be obtained with it. Almost any metal or alloy can be welded by it, and not only can this be done, but dissimilar metals, such as brass and steel, can be welded together.

The following metals have been actually welded together by the electric welder and also to each other:

Wrought-iron, cast-iron, copper, lead, silver, zinc, antimony, gold, manganese, platinum, aluminum, nickel, bismuth and cobalt.

The following alloys have likewise been welded:

Tool-steel, special-steel, chrome-steel, steel-castings, tungsten-steel, brass, gun-metal, nickel-steel, phosphor-bronze, aluminum-bronze silicon-bronze, German-silver, solder, type-metal, and other special alloys.

The following dissimilar metals and alloys have been successfully welded:

Copper to brass,
Copper to gold,
Copper to German-silver,
Copper to silver,
Brass to iron,
Brass to steel,
Brass to tin,
Brass to German-silver,
Brass to platinum,
Tin to zinc,
Tin to lead,
German-silver to iron,
Gold to silver,
Gold to German-silver,
Steel to platinum,
Silver to platinum.

It will readily be appreciated, therefore, that a large number of special welds may be made and which are of interest to the non-ferrous metals trades. By the use of these welds many classes of goods may be made and much difficult work produced previously unthought of or considered impossible.

So far, the work accomplished by the electric welder has been confined to wire and sheet metal goods, but by adapting the machines, large and heavier work may be accomplished. The principle remains the same whether large or small work is performed, and special machines can be designed to conform to difficult requirements. The large number of machines now manufactured by the company, indicates that they have been conscious of the fact that each different manufacturer may require a different machine; and this is the reason for the large variety of appliances turned out.

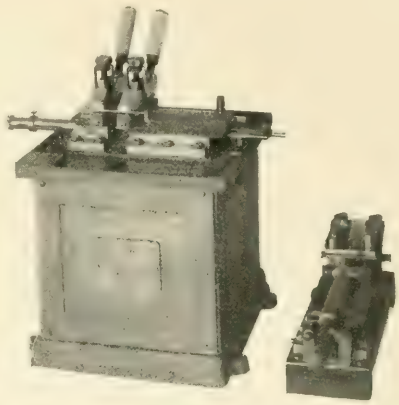


Fig. 2. Electric Welder for Copper Wire.

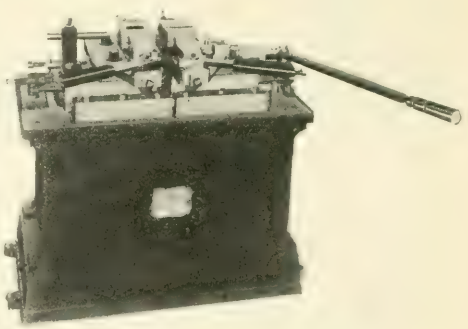


Fig. 3. Electric Welder for Welding Hollow Handles on Steel Knives.

The large variety of work that can be done by means of the electric welder may be appreciated by reference to Figs. 1 and 4. The articles shown were actually welded by the machine. The hollow handle was welded to the steel knife and the sharp fin at the joint may be seen. The fork shown was of German-silver and a steel handle was welded on it. The joint is indicated by the fin.

In Fig. 1 there are shown pieces of steel wire that were welded. Soft steel wire welds with a round swelling at the joint, while very hard steel wire takes more current and has a ragged fin at the weld. The varieties of other welds may be seen in Fig. 1. The slight fin

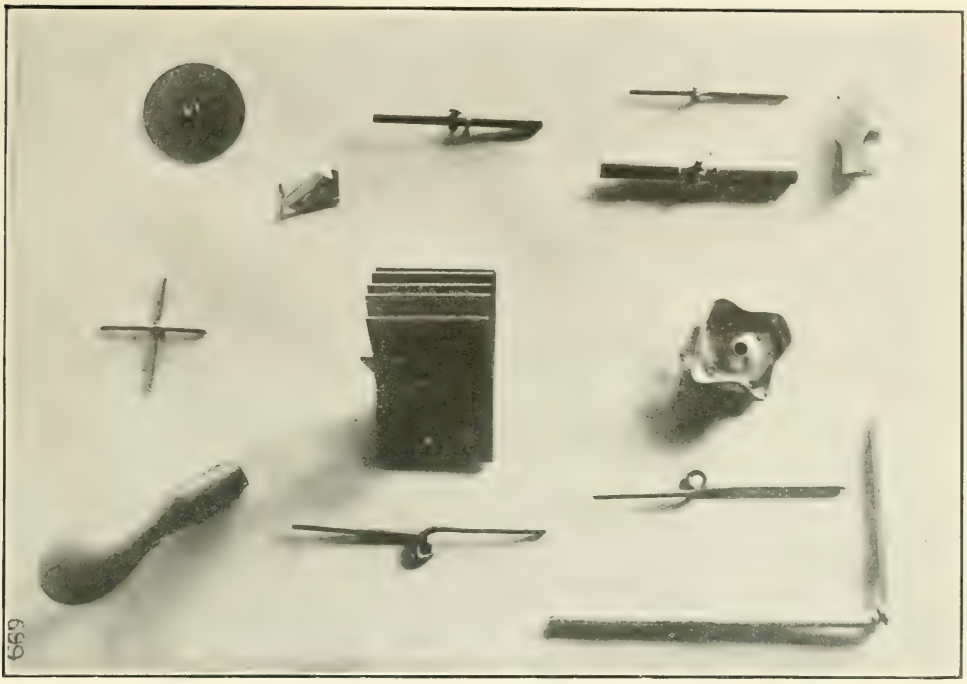


Fig. 4. Various Kinds of Metals Electrically Welded.

produced at the weld is, of course, unavoidable and must be trimmed off. In many cases, this can be accomplished by a machine or by hand with a slight amount of labor. In Fig. 4 are shown a variety of difficult welds of dissimilar metals and also steel. The hollow handle shown was made by welding two pieces together. Steel wire welded crosswise is

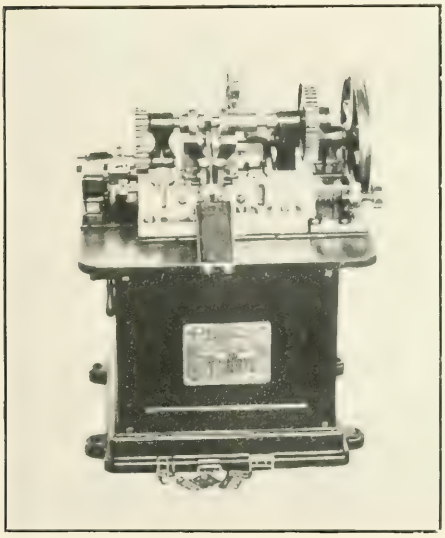


Fig. 5. Buckle Welding Machine.

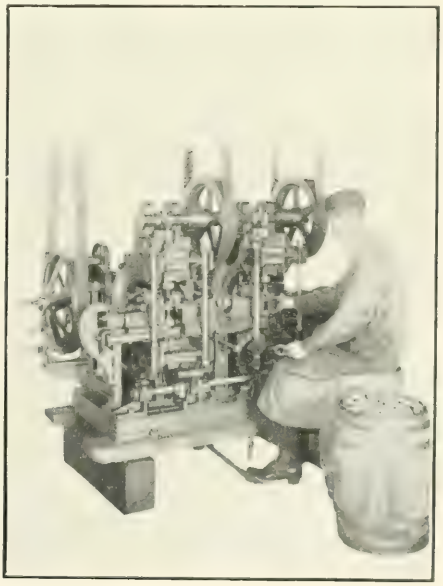


Fig. 6. Ring Welding Machine.

shown and this application is now made in the manufacture of wire netting, and to take the place of twisted joints. A brass button welded to a steel disc is illustrated, as well as spot welded steel and aluminum sheets. Welded brass, aluminum and copper wire are shown and a brass wire ground down at the weld to show the homogeneity of the weld may be seen. The possibilities of the process can readily be appreciated from these examples.

Some special welding machines are shown in Figs. 2 and 3. In Fig. 2 a welder for use in welding copper wire is shown. This is supplied with a breakswitch and the operations are as follows: Open the side and clamp the wire. Then release the latch and close the breakswitch when the weld is made. This machine may also be used for brass wire, but in this case a different voltage is employed. Copper reaches the welding state quickly and the welder is made sensitive by means of roller or ball bearings and weight or spring pressure.

In Fig. 3 a special machine for welding steel

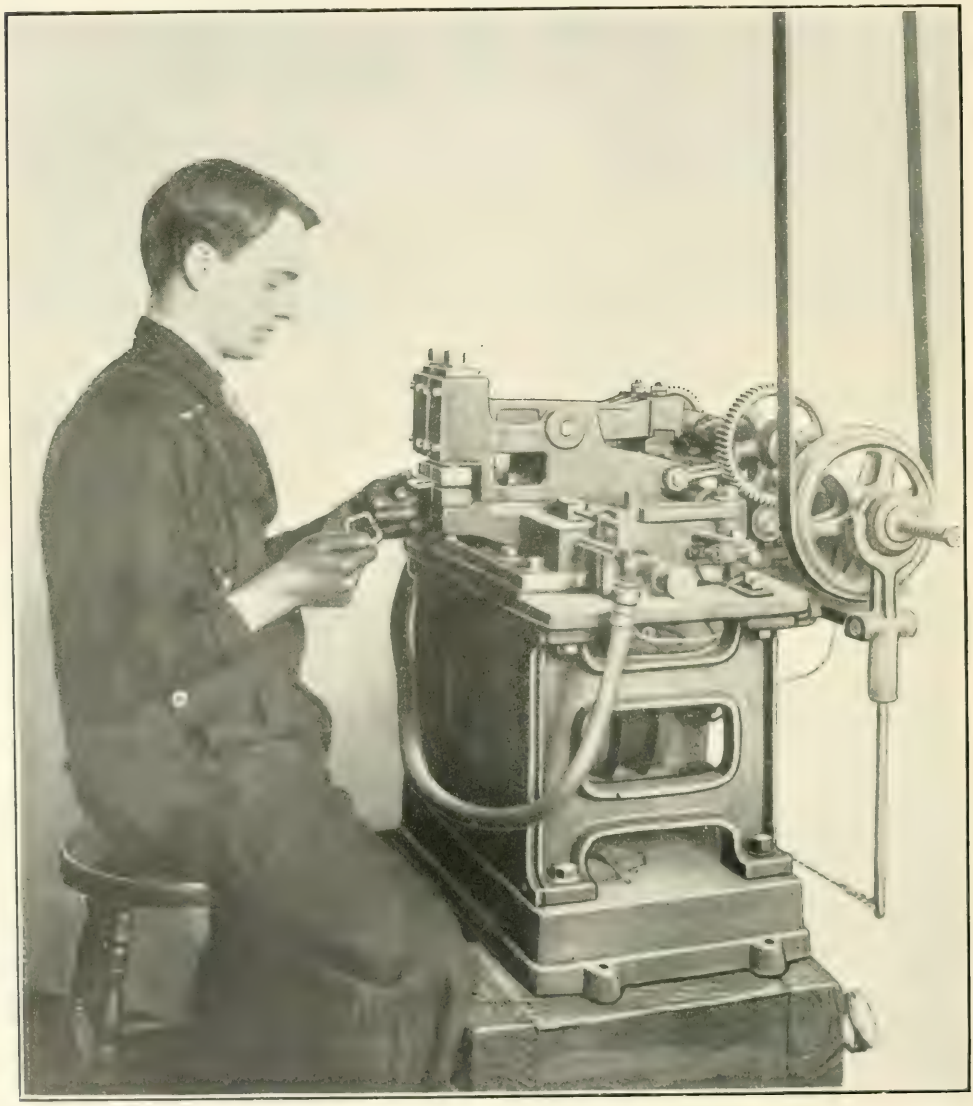


Fig. 7. Showing A Buckle Welder in Operation.

hollow-handles or blades is illustrated. The clamps on this machine are removable. Forks may also be welded on the machine.

In Fig. 5 is shown a machine for welding steel buckles and is similar to that shown in Fig. 7. The buckles are made of wire and the joint welded. In Fig. 7 the method of welding the joint is shown and the ease with which it may be accomplished. The operation requires no more skill than the operation of a foot-press and unskilled labor may be employed upon it.

In Fig. 6 is shown a special machine for welding rings. This has two working heads but one operator is employed. The swelling produced by the welding is reduced on the machine, leaving a slight fin inside and outside which can be sheared off by a punch press. Steel rings up to 2 inches in diameter can be welded on this machine. Some 900 rings per hour is the regular output and two seconds are consumed in the welding operation.

The machines herewith illustrated are manufactured for the trade by the Thomson Electric Welding Co., of Lynn, Mass., and to whom we are indebted for the illustrations.

Artificial Graphite Unsuited for Crucibles.

Soon after artificial graphite made its appearance upon the market, crucible makers tried it out in the manufacture of crucibles but found it wanting. What properties it lacks for the making of this class of goods has not been clear and, therefore, the remarks recently made by Dr. Edward G. Acheson, the inventor of artificial graphite, are of interest. These remarks were included in an address made before the Faraday Society of London, England. Tracing the discovery of artificial graphite, he says:

"The next step was to look around for a cheap material from which to make the soft, unctuous graphite wanted. Eventually in 1906 a suitable material was found in the waste from the anthracite coal mines of Pennsylvania from which all foreign matter had to be evaporated. This was found to yield a non-coalescing graphite that was easily pulverized. It was hoped that it might have been useful for making crucibles, but it was not successful in this direction, not being dense enough. As a matter of fact, the material expanded very much in the transformation into graphite.

Some Notes on the Production of Black-Nickel.

It is now some six years since the black nickel formula at present used was first published (The Brass World, August, 1906, page 263) and the test of time has demonstrated it to be the most serviceable and blackest of any of the formulas, and at the same time it is permanent. Previous to the publishing of this solution, the black nickel formulas contained arsenic which not only produced a gray deposit, but caused them to fade in time. These facts greatly militated against the use of arsenic and so much so that to-day they have fallen into disuse. The black nickel formula first published in The Brass World has supplanted other formulas and the test of time has proved it to be quite satisfactory and permanent.

Much has been published in this publication about this black nickel formula and the information has been distributed over a number of years, resulting in some improvements and in overcoming some of the difficulties found. Each of the articles has met with the approval of the trade and the demand for them has been so great as to completely exhaust the issues of The Brass World containing them. The demand for these articles has become so extensive that it has been deemed advisable to re-publish them and the following article on the subject of black-nickeling embodies all the information contained in previous papers and the improvements made and difficulties overcome. It is believed it will meet with the ready approval of platers who desire to have a complete article on the subject.

Formula for Black Nickel Solution

The formula for the black nickel solution is as follows:

Water	1 gallon
Double Nickel Salts	8 oz.
Ammonium Sulphocyanate	2 oz.
Zinc Sulphate	1 oz.

The double nickel salts are the regular nickel salts employed in making up a nickel plating solution and are the double sulphate of nickel and ammonia. Either ammonium sulphocyaniate or potassium sulphocyanate may be used, but the ammonium sulphocyanate is slightly cheaper. Sulphate of zinc is the well known commercial grade. It is unnecessary to use chemically pure materials, any well known standard commercial brands answer the purpose.

Making the Solution

To make the solution, dissolve the double nickel salts in the right amount of clean water, either cold or hot, and then add the ammonium sulphocyanate and sulphate of zinc. Mix well and allow to cool. It is unnecessary to filter it. The solution is run cold, but in winter, when the temperature is excessively low, it should be warmed to about 70° F.

The Anodes

The anodes used in the black nickel solution are the regular anodes employed for nickel plating, but better results are obtained if old instead of new ones are employed. Old anodes give up their nickel more readily than new ones and it is for this reason that they are preferred. To be sure, new anodes can be employed, but the solution will not work regularly with them for as long and will require attention sooner.

One thing should be borne in mind and that is to have plenty of anodes. It is false economy to use too few, for then the solution will become acid sooner and work irregularly. When plenty of anodes are used, the solution will work in a normal manner for the maximum time and the solution will be fed properly. There cannot be too many anodes used.

As the black nickel does not "throw" as well as white nickel, the anodes are preferably placed on both sides of the article, or around it as the case may be so that the current will pass evenly. In this manner it is possible to cover any surface evenly and uniformly. The anodes should be cleaned from time to time

The Current

The regulation of the current used in depositing black nickel is the most important feature of the operation, and upon it depends the success of the process. *Not over 1 volt should be used.* A greater quantity will cause the deposit to become streaked, and if an excessive quantity is used, it will be gray or white. This current regulation is very important and it is impossible to obtain satisfactory results unless the current is cut down to the amount previously mentioned.

It is in the matter of current regulation that platers usually err, and the principal fault is to use too strong current. If a good black nickel is desired, then the current *must* be maintained at 1 volt and no more. Bear this in mind.

The Deposit and Its Formation

When the solution has been properly made and the current density has been adjusted to the right amount, the first flash of black nickel deposit will be iridescent, but will cover the whole surface of the article being plated. This takes place within a few seconds but gradually. When the iridescent color forms it indicates that the solution is in proper working order. A black color should not form at once, but should be obtained by first producing the iridescent deposit.

After the iridescent deposit has formed, and the current has passed for a short time longer, it disappears and a blue color makes its appearance. This, however, gradually changes to the black, the real color of the black nickel.

The length of time taken for the electrodeposition of the black nickel may be from 10 to 20 minutes. It should be borne in mind that the deposit is not a pure metal but a sulphide of nickel and is somewhat brittle. For this reason it is essential that the deposit should be light. It is a common error to produce too heavy a deposit. It is apt to flake off and nothing is gained by it. When the article has a uniform black color on the surface, the deposition can be stopped. To carry on the deposition for a long time produces a hard and thick deposit that is quite apt to flake off. A thin deposit, when the color has been obtained, is sufficient.

The Base Metal Used for Plating

The base metal, upon which the black nickel is to be deposited, may be of any metal that can be plated with white nickel. It is needless to say that the surface should be clean and free from tarnish. Very careful preparation, therefore, is needed for the black nickel solution has no grease removing properties. Some platers claim that better results are obtained by first giving the article a white deposit, and then deposit the black nickel on it. Whether this is true is doubtful, and if it is used, then the deposit of white nickel should not be buffed as it will then be difficult to clean. Only a flash deposit should be used at any event.

If the surface of the base metal is buffed, then the black nickel deposit will be polished. Dead surfaces likewise produce a dead black nickel. In this connection it may be stated that the polished or buffed surface upon which the black nickel is deposited should be used whenever possible as the black nickel deposit is then dead black. Upon dead surfaces it has

a gray shade or is slightly off color. The blackest shade is obtained on polished surfaces.

Care of the Solution

The solution should be maintained in a strictly neutral condition. If it becomes acid, then the deposit is either streaked or gray. If alkaline, the deposit is brittle and will easily flake off. When freshly made, the solution will stand between 6 and 7 degrees Beaumé and water should never be added to it. The best results are always obtained when the solution is strong. Water will make it plate gray.

As the solution is used, it will gradually become acid for the reason that the nickel is not obtained from the anodes in sufficient amount to compensate for that deposited. When plenty of anodes are used, however, this will take place only after some time. When this is the case, the deposit will become streaked. To bring back to its original condition ammonia should be added to it in small quantities at a time, the solution thoroughly stirred and then tested with litmus paper. The right condition is obtained when red litmus paper does not turn blue, or blue litmus paper red. Such a condition is one of neutrality. The bath has the appearance of any nickel solution, that is light-green, and should under no consideration be blue. This indicates too much ammonia has been added.

Improving the Color.

The color of the black nickel, when it first comes from the solution leaves nothing to be desired. Upon standing, however, it is apt to have a brown shade. This brown shade frequently is seen when the article is removed from the bath. A gray shade is likewise often present. While lacquering will remove the brown shade, it will not completely mask the gray color. For this reason, it is frequently advisable to use a dip to remove the brown or the gray shade. This dip is composed of the following:

Water	1 gallon
Perchloride of Iron	12 oz.
Muriatic Acid	1 oz.

The articles, after they have come from the black nickel solution, are rinsed in cold water and then immersed for a few seconds in the preceding dip. This will remove the brown or gray shade. They are then rinsed in cold water, then in hot water, dried and lacquered.

This dip is slightly acid and has the property of removing the brown or gray shade on the black nickel deposit produced by the presence of sulphide of zinc.

It is always advisable to lacquer the black nickel deposit if possible as it not only serves to protect the surface, but prevents discoloration. All black nickel deposit will show a slight discoloration upon standing in the air, but which may be removed by buffing or wiping. The lacquer, however, will prevent this difficulty.

Cause of Difficulties

The following notes will serve to indicate the source of the difficulty found in plating black nickel:

1. The deposit has spear-shaped markings on it and is partly white.

Remedy: Use a weaker current.

2. The deposit flakes off after the article has stood for some time.

Remedy: The deposit is too heavy and the electrodeposition has consumed too long a time.

3. The deposit is white.

Remedy: The current is too strong or the solution has become acid. Use a weaker current or neutralize with ammonia if acid.

4. The deposit is still brown or gray after coming from the dip.

Remedy: The dip is old or the article has not remained in it sufficiently long. Make a new dip or leave the article in longer.

5. Although the voltage is right, the deposit is streaked.

Remedy: The solution has become acid and requires neutralizing with ammonia.

6. The edges of the deposit are removed by the dip.

Remedy: The dip is too strong or the deposit is not sufficiently heavy. Use the dip cold. Do not leave in the dip for more than a few seconds.

If care is taken in maintaining the right voltage and keeping the solution neutral, no difficulty will be experienced in obtaining a good black nickel deposit.

Voltmeters and ammeters should be occasionally tested with standard instruments to ascertain whether they have become inaccurate. These instruments all contain permanent magnets and in some classes of cheap instruments they are permanent in name only. The magnets lose their magnetism and the instruments then become inaccurate in their readings. The instruments, under such conditions usually read too high.

Manufacture of "Leonic-Ware" in Bavaria.

The manufacture of gold and silver trimmings, tinsel ornaments, braids, tassels, etc., known in the trade as "leonic ware," including the manufacture of silvered and gilt copper wire or thread from which the same are made, is one of the many industries of Nuremberg and vicinity. There are in Nuremberg and the neighboring cities of Schwabach, Roth, Treuchtlingen, Weissenburg, Allersberg, and Ansbach about 20 factories engaged in this industry. Three-fourths of these manufacture only the finished product, while the other fourth manufacture the silver and gilt thread, the raw material, as well as the finished articles. The largest of these factories is at Roth, near Nuremberg, and employs, including some home workers, about 700 work people. This plant manufactures both the metal thread and the finished product. The second factory in size is in Nuremberg, and employs about 400 wor people, but makes only the metal thread.

In all, about 2,500 workmen are employed in this industry. Of these, 60 per cent. are females. Only a few children, from 13 to 16 years of age, are employed, as the law in regard to child labor is quite strict; such as are employed may work only 6 hours per day, and earn 75 cents to $1 per week. Female employees over 16 years of age earn $3 to $4 per week, and male employees $5 to $6 per week.

The value of the annual output in this industry from the factories in this vicinity is about $2,500,000, and while much of the product is used at home, the near Orient—Turkey, the Balkan States, Egypt, and Asia Minor—is the best customer. India, China, and Japan also buy freely. The United States was formerly a fairly good customer, but in recent years has been buying practically only the silvered and gilt thread and has manufactured the finish product at home. This thread the American manufacturer, it seems, is not able to make successfully. In 1911 leonic ware, mostly the metal thread, to the value of $179,707 was sent from this district to the United States. This was a decrease of $18,150 as compared with 1910.—*Daily Consular Report.*

Tantalum has been found suitable for springs in place of steel and has the advantage of this metal that it is non-corrosive.

Is Ammonia Advantageous in Silver Solutions?

Whether ammonia has any advantage in a silver plating solution is an open question. Some platers maintain it is, but can give no reason for it, nor any fact regarding its effect. Others say that it has no advantage.

The fact that old silver solutions smell of ammonia while one freshly prepared does not, indicates that ammonia is formed by the decomposition of the cyanide in them. For this reason, many platers believe that ammonia is necessary to "age" a silver plating bath and that it will not work well when new on account of the absence of ammonia. Roseleur seems to share this view as he says in his *Galvanoplastic Manipulations*:

"Electro-silvering baths do not generally work so well when freshly prepared, as when they have been used for a certain length of time, and have been "electrolyzed." The deposit is not always uniform, and is often granulated, bluish or yellowish. It is, therefore, desirable to mix a portion of old liquors with those recently prepared. New baths may acquire an artificial age by boiling them for a few hours, or adding one or two thousandths of ammonia."

While Roseleur shared the belief that ammonia is important in a silver solution, he gives no facts to prove it is essential. The matter, then, remains simply as an opinion and experiments are necessary to demonstrate its value. It may be said, however, that it is an open question whether ammonia is necessary in a silver bath as it is possible to obtain a good deposit from a new solution, provided, of course, that it is made up properly and run with the right current. The evidence is against the use of ammonia, but it may be said that as far as known no harm results when it is used, so that if a plater desires to be on the safe side he can add it to his solution.

The use of ammonia, therefore, is a matter that needs a careful series of experiments to demonstrate whether it has any value in a silver plating solution.

Silver can only be successfully deposited in a cyanide solution. Attempts to use other solutions have always resulted in failure as the deposit is not satisfactory for commercial purposes.

Standard Brass Foundry Mixtures and Method of Making Them.

By Erwin S. Sperry.

(Continued from page 230, July 1912)

Ordinary Yellow Brass Castings

The requirements of brass for making ordinary yellow brass castings in a brass foundry are that the casting shall be cheap, cut freely and produce good castings. As the majority of this class of work is such that a little aluminum can be added for rendering the brass free casting, considerably more zinc can be used in the mixture than would be advisable for work in which aluminum could not be employed. It can safely be said that there is very little ordinary yellow brass work of the miscellaneous kind, similar to that indicated in Fig. 1, in which aluminum cannot be used with excellent results.

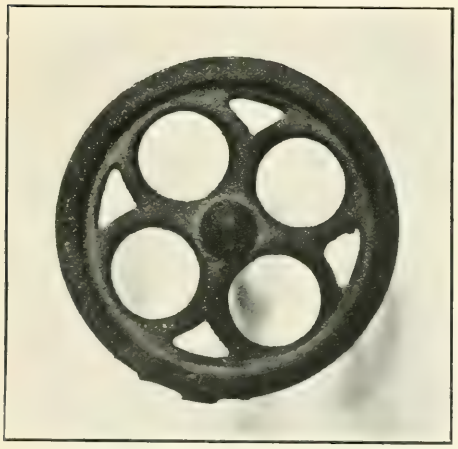


Fig. 1. Illustrating An Ordinary Yellow Brass Casting.

There has always been a prejudice against the use of aluminum in yellow brass and many arguments have been put up in its distavor; but most of these have been proved fallacies. Among them was the argument that the aluminum interfered with soldering, but this was caused by the use of too much aluminum — several per-cent—which no brass founder would think of employing. A few hundredths of a per-cent suffices and no difference can be detected in the ease of soldering or the strength or permanence of the joint.

For ordinary brass castings, the following mixture is recommended:

Mixture for Common Brass

Copper	62 lbs.	or 620 grams
Zinc	35 lbs.	or 350 grams
Lead	3 lbs.	or 30 grams
Total	100 lbs.	or 1000 grams

Saddlery Hardware

One of the largest uses of yellow brass has been in the manufacture of saddlery hardware, and it is still extensively employed. The replacement of the horse by the automobile, however, has decreased the consumption of this class of goods and undoubtedly will still more. Large quantities of saddlery hardware, however, are still manufactured in the shape of buckles, turrets, ornaments, etc.

The requirements of saddlery hardware are not severe. In fact, they are quite easy to meet. The brass must be yellow and not have a red shade such as that produced by the use of too much zinc in the mixture, and it must cut freely and be sound so as to be free from pin-holes or other imperfections when polished.

Fig. 2. Indicating Mixture for Saddlery Hardware.

In addition, it must be cheap. All saddlery hardware manufacturers use aluminum in their yellow brass and it was in this class of work that this metal was first fully appreciated. Previous to this time, the hardware was cast "on end", and only a limited number of pieces could be put on the gate. By the use of a little aluminum in the brass, however, the number of

pieces on the gate were doubled and the castings made "flat".

The best mixture for saddlery-hardware is the following:

Mixture for Saddlery Hardware

Copper	66 lbs or 660 grams
Zinc	31 lbs. or 310 grams
Lead	3 lbs or 30 grams
Total	100 lbs. or 1000 grams

Imitation Manganese-Bronze

The extensive use of manganese-bronze and the fact that it is such a strong metal have created a demand for a brass or bronze that

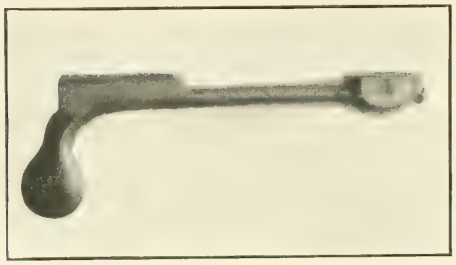


Fig. 3. Automobile Casting Illustrating Application of Imitation Manganese-Bronze.

is cheaper than this material but with a strength greater than yellow brass. Manganese-bronze is really a brass as it contains much more zinc than is in ordinary yellow brass. Its color, however, is such that it is called a "bronze".

It is possible to make a good imitation manganese-bronze without any difficulty, and which will have the same color and be strong enough for many purposes, although inferior in this respect to standard manganese-bronze. It will find uses in many ways, particularly in automobile castings and other structural work for which yellow brass is not sufficiently strong.

The following mixture is suitable:

Imitation Manganese-Bronze Mixture

Copper	55.00 lbs. or 550 grams
Zinc	44.00 lbs. or 440 grams
Tin	0.50 lbs. or 5 grams
Aluminum	0.50 lbs. or 5 grams
Total	100.00 lbs. or 1000 grams

Plumbers' Brass Goods

Plumbers' brass goods constitute the largest consumption of yellow brass in the form of sand castings. While much of the work is cast in red metal, the competition is such in the plumbers' goods trade that many manufacturers have been forced to make yellow metal goods against their will. Nickel plating, now exclusively used on interior work covers up the yellow brass so that the customer does not know what the base metal is. To be sure, yellow brass answers the purpose and is cheap so that it is probable that the future will not see less of it used, but on the contrary more.

Ordinary yellow brass given in a previous formula can be used for making plumbers brass goods, but it is not as good as the mixture about to be given. In making goods of this kind to stand pressure, leakage when tested, is the cause of many castings going back into the melting pot. The more zinc there is in the mixture the greater is this loss from leakage. It is preferable, therefore, to use a better mixture and have less leakages. The following will be found quite satisfactory for the purpose:

Fig. 4. Showing Application for Plumbers' Brass Goods.

Mixture for Plumbers' Brass Goods

Copper	70.0 lbs. or 700 grams
Zinc	26.5 lbs. or 265 grams
Lead	3.5 lbs. or 35 grams
Total	100.0 lbs. or 1000 grams

Aluminum is never used in the manufacture of plumbers' brass goods as it causes the castings to leak under pressure, even though this be very low.

The Blistering of Silver Deposits.

Silver deposits rarely blister, and indeed this difficulty is so seldom encountered that few platers are familiar with it. It has often been said that silver will not blister, although untrue, of course. A case of the blistering of a silver deposit was recently found and which proved to be quite interesting. The facts of the case are as follows:

A plater desired to make some pure silver

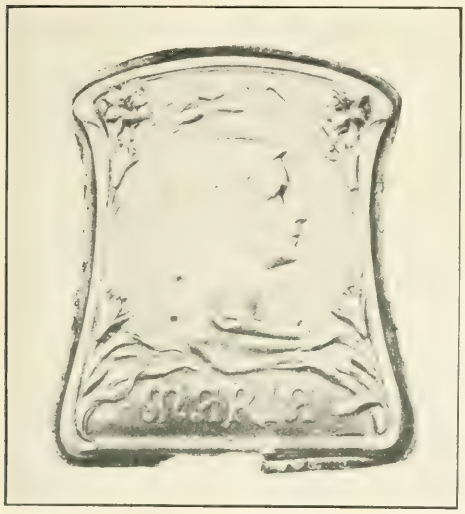


Fig. 1. Blistered Silver Electrotype.

electrotypes and made a gutta-percha mold, coated it with graphite and then deposited the silver upon it in the manner followed in making copper electrotypes. The silver solution used, contained about 8 oz. of silver to the gallon and was, therefore, quite strong. This was done to render the deposition of the silver rapid.

The silver was deposited in the regular way, but the current was as strong as it was possible to use it without actually burning the deposit, and the deposition, therefore, took place rapidly. Blisters formed on the surface of the silver electrotype (or on the back as it was attached to the mold) and which may be seen by referring to Fig. 1. This electrotype was about 1/8 in. in thickness and the back side may be seen in Fig. 2.

The cause of this blistering was undoubtedly the strong current and the gradual accumulation of free cyanide in the bath. The rapid deposition of the silver, caused the increase in free cyanide on account of the absence of a sufficient number of anodes in the solution, and this influenced the formation of blisters.

It is believed that this is an instance rarely encountered in silver plating, but it indicates that silver, like other metals deposited from a cyanide solution, will blister when plated.

Copper and brass, when deposited from cyanide solutions are very apt to blister when there is too much free cyanide in the solution and when the current density is too high. Silver may blister under ordinary conditions but it is rarely encountered. It may be possible, however, that some of the difficulties met with in the plating of goods with silver, in the shape of spots, may be caused by blisters although they may be invisible to the naked eye.

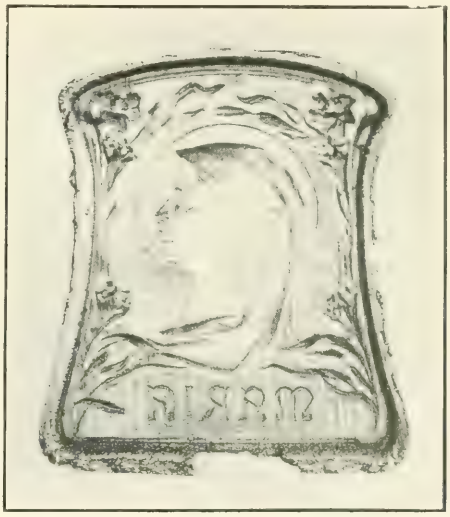


Fig. 2. Back Side of Fig. 1.

It seems strange that blisters would not be encountered, when in the case of brass or copper, they are very frequently found. Indeed, many of the instances of blistering of these metals is so slight as to remain almost unnoticed unless viewed under a microscope.

The blisters, shown in the illustration indicated in Fig. 1. may serve to teach us to be on the lookout for them in a minute form on commercial silver plated goods.

Lace may be copper plated by first rendering waterproof by shellac, then giving a coat of thin varnish, and, before this completely dries, brush over fine copper-bronze powder. When the varnish is dry, the copper is deposited in an acid copper solution.

Ceylon's Graphite Deposits.

A description of the graphite deposits of Ceylon, from which all the graphite used in the manufacture of graphite crucibles is obtained, was recently printed in the Daily Consular and Trade Reports. The information was from Consul-General Robert P. Skinner of Hamburg, Germany:

The graphite deposits of Ceylon are of especial interest to Americans, because most of the graphite used in this country comes from that island and because the United States has for years been the largest consumer of the Ceylon material. Much has been printed in regard to these deposits, but it is widely scattered through publications which are not accessible to the American public. The writer has, therefore, summarized the more important facts which are on record.

Although their existence was long known and mentioned in print as early as 1681, the graphite deposits of Ceylon were not exploited until some time between 1820 and 1830. Joseph Dixon is said to have imported a small quantity into the United States in 1829, but it was not until 1834 that the industry assumed any commercial importance. From that time to this, as a result of the growth of metallurgical industries and the resulting demand for refractory materials, the industry has developed rapidly, until at present graphite is subordinate in value only to tea and the products of the cocoanut palm among the exports from Ceylon.

Up to 1901 Great Britain consumed more Ceylon graphite than any other country. Since 1901 the United States has assumed first place, with Great Britain second until 1909, when Germany took second place. [Plumbago invoiced at the Colombo consulate for shipment to the United States had a declared value in 1910 of $1,789,035, and in 1911 of $1,034,331.—B. of M.] It is interesting to note that an American firm is one of the principal exporters of Ceylon graphite. With the exception of the operations of this firm and of a limited amount of graphite mining done on tea estates, the industry is in the hands of native Cingalese. It has been estimated that the various processes of mining, sorting, "curing", packing and shipping graphite, as well as making the barrels in which it is exported, provide employment for about 50,000 men, women and children.

The deepest and best graphite mines are near Kurunegala; others are located near Kegalla, about 15 miles to the south, and near Ratnapura, both in the Province of Sabaragamuwa. The graphite is mined either from open pits or through vertical shafts connecting with underground workings. Most of the mines are not deeper than 100 feet, though a few go as deep as 400 or 500 feet. On account of the heavy rainfall water is one of the chief obstacles to deep mining. In a few mines steam pumps and hoists are employed, but as a rule the mining methods are still crude, the acme of mechanical ingenuity being reached in a windlass operated by five or six men for hoisting the graphite in a sort of tub. The workmen usually ascend and descend by means of rough wooden ladders, tied with jungle ropes and rendered exceedingly slippery by the graphite dust and water.

The mineral as it comes from the pits may contain as much as 50 per cent. of impurities, mostly in the form of quartz and wall rock. It is conveyed in bags to a dressing shed, where it is picked over and the impurities reduced to 5 or 10 per cent. It is then packed in barrels for transportation to Colombo or Galle. At these ports it is unpacked and submitted to further treatment known as "curing." The graphite merchants have fenced yards or "compounds" for the final preparation of the graphite for the market. In the methods of "curing" there is some diversity, but the first step is usually to set aside the large lumps and to pass the remainder through stationary screens of several different sizes of mesh. The large lumps and the screened pieces are then broken with small hatchets by Cingalese women to remove the coarser impurities, such as quartz, and are then rubbed up by hand on a piece of wet burlap and finally on a piece of screening to give them a polish. Finally, various grades coming from several mines or differing in size or texture are blended to meet the requirements of purchasers, a process requiring skill and long experience.

The poorer material is usually beaten to a powder with wooden mauls or with beaters shaped like a rolling pin, and is then sorted into different grades. In some establishments the impure grades are washed in a tub or pit. In this process the mineral is placed in saucer-shaped baskets and by a circular "panning" motion of the immersed baskets the graphite particles are thrown off into the pit, while the

heavier impurities, especially pyrite, remain behind. To separate the very fine material, the powdered graphite is placed in a basket shaped somewhat like a large dishpan. The contents of the basket are thrown into the air, and the heavier particles fall back into the basket, while the finer material is blown forward and falls on the floor."

Yellow Silver Deposits.

Platers frequently encounter a yellow silver deposit and have difficulty in producing the pure white metal so much desired. A yellow shade on silver is quite undesirable and often leads one to believe that the metal is impure. Roseleur's comments on the matter are of much interest and are as follows:

"The greatest reproach to electro-silver plating is that the deposit does not remain white, but becomes yellowish by contact with the air. This phenomenon is due to the simultaneous deposit, by galvanic action, of pure silver and a subsalt, the subcyanide of silver, which is decomposed and darkened by light. It is, therefore, sufficient to eliminate this latter compound, and the inconvenience will disappear. This may be arrived at by the following methods:

1. The articles are left immersed in the bath for some time after the electric current has been interrupted, when the subcyanide of silver is dissolved by the cyanide of potassium.

2. After having smeared the objects with a paste of borax, they are heated in a muffle until the salt fuses and dissolves the subcyanide. This process softens and anneals the metal.

3. The poles of the battery (or dynamo) are reversed for a few seconds, that is to say, the articles become soluble anodes, and the electric current carries away the subcyanide of silver in preference to the metal. It is evident that this operation should be very short, otherwise the silver will entirely abandon the objects and will coat the silver anodes; and should the operation last still longer, the base metal itself will follow the same direction."

Spray-lacquering is now extensively used and it has proved the most satisfactory means of applying lacquers in many instances previously believed impossible. By its use, practically any thickness may be obtained.

A Peculiar Case of Crystallization of Sheet Brass.

The crystallization or season-cracking of brass has always been a perplexing problem. An instance has recently been found in which sheet brass crystallized under peculiar conditions. The brass was made by one of the large brass rolling mills and from good materials. The brass was used for bands around the cylinder of a large gas engine and it was while on the engine that the cracking took place. The gas engine manufacture makes the following statement in regard to the matter:

Season-Cracked or Crystallized Sheet Brass From a Gas Engine.

"We bring one of our engines into the shop and put a jacket on it, which is sheet iron, placed over the wood jacket. The brass band stock is used for the hoops to hold the sheet iron in place and trim the engine. It is used on very large circumferences, and we have never had a particle of trouble with it until recently.

After these engines are jacketed, they are run down to our warehouse awaiting shipment. We have brought three or four of them up for shipment within the last few days, and find a lot of the brass sheet stock used for the bands has broken while standing in the warehouse."

A piece of the brass sheet which crystallized

(about 2 in. in width and about No. 16 gauge) is shown in the illustration.

It will be noticed that the brass crystallized and broke without any apparent outside influence and this renders the case more perplexing. In connection with this crystallization or season-cracking of brass, it may be said that the following are some of the causes known to bring it about:

Excessive reduction in rolling without annealing or, in other words, the fatigue of the metal.

Minute fire cracks formed in the brass during annealing, but not sufficient to cause the metal to break. These, like a small crack in a piece of glass, will finally develop crystallzation.

Action of ammonia and its compounds. Ammonia, it is well known, will cause crystallization and any compound evolving ammonia, such as animal excretions, will likewise produce it.

Constant vibration of the brass. This is a frequent source of crystallization and will have the same influence on steel under the right conditions.

Excess of oxide of copper or zinc in the brass. Or the presence of impurities, such as bismuth or antimony.

Which of these causes was the one that brought about the crystallization of the sheet brass, it is impossible to say, and an investigation would be necessary in order to solve it, and then it might be fruitless. In nonferrous metallurgy, there is nothing so perplexing as the crystallization of brass, and there is no subject worthy of so much investigation. Comparatively speaking, very little is known about it.

The electric furnace has been found quite efficacious in smelting tin-dross as it is possible to obtain the high heat necessary for the reduction and fluxing of the tin oxide.

The first dynamos used for electroplating in the United States were those manufactured by Wallace & Sons of Ansonia, Conn., then large brass goods manufacturers. This dynamo was known as the "Little Joker" and was the first low voltage machine successfully made for electroplating work. It was placed on the market in the early'70's and previous to this time batteries were employed. Many of these "Little Joker" machines are still in use.

The Demand and Use for Quick-Silver (Mercury).

Consumption of quicksilver is mainly in the manufacture of fulminate for explosive caps, of vermilion, of drugs, of electric lighting apparatus, of scientific apparatus, and in metallurgy in the recovery of gold and silver, principally of gold by amalgamation. There is little prospect for materially increased output from the old producing mines, and the eventual working out of well-known deposits will probably barely be offset by the development of new ore bodies now known. The low tenor of the bulk of the ores now worked, the increasing cost of production, the present low tariff, the remote locations of the Nevada and Texas producers and their consequent difficulties of supply, cause the present outlook for increased quicksilver production not to be particularly bright—except possibly for the largest mines. These mines are probably mainly depended upon for the bulk of the domestic output, but no great increase in production as a whole is expected. This fact, and the probable continuance of the annual domestic demand for at least 20,000 flasks of quicksilver, should continue a good market at fairly good prices. High prices will bring in foreign supplies at the present tariff rate, which is 7 cents per pound, or $5.25 per flask of 75 pounds, and will react to continue prices at probably under $50 per flask. The foreign market is open to competition with the great European supplies, mainly from Spain and controlled in London.—*Daily Consular Report.*

Rolling Zinc and Aluminum Alloys.

According to a British patent recently issued to T. A. Bayless and B. G. Clark, a zinc and aluminum alloy consisting of

Zinc	99.85%
Aluminum	0.10%
Lead	0.05%

may be rolled without difficulty. The aluminum and lead are first melted after which the aluminum is added. The melting temperature of the zinc is maintained at from 350° to 450° C.

The zinc is cast into molds in the usual manner and then rolled hot. The rolling temperature has been found to be from 150° to 200° C. If annealing of the sheets is required, it is done at a temperature of from 200° to 250° C.

The Manufacture of Art Brass Wares in India.

By Felix Koch.

Few people of all this world have the infinite patience shown by the brass worker of India in the curious specimens of art brass wares he manufactures. Most of these are ornamental work, pure and simple, and are made on the chance of selling to some nabob or other Indian potentate, either for his palace or for his gift. Rich tourists in that country are another great source of profit to our friend; and often he works with these persons distinctly in mind.

Fig. 1. Method of Making Art Brass Ware in India.

How many hours it will take to set up such a device as this it is impossible to even faintly conjecture. The man at work is shown in Fig. 1 and the method of producing the wares may readily be seen. In Fig. 2 is illustrated an elaborate piece of wrought brass work made by the same workman and solely by hand labor.

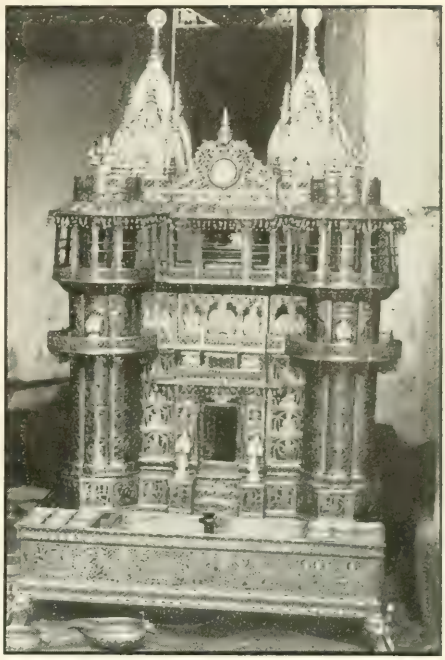


Fig. 2. Brass Article Made In India.

A French Method of Nickel Plating Aluminum.

A method of electroplating aluminum has recently been patented in France by Marc Chirade and Joseph Canac of Paris, France. The process is for the direct nickeling, without depositing any other metal upon the aluminum previously. The method used by these inventors is as follows:

1. Immerse the article to be nickeled in tepid water and then wash in water containing 2 per-cent of potassium cyanide.

2. Immerse the article, after the previous treatment, in the following composition:

Hydrochloric Acid.....	1 gallon
Water	1 gallon
Chloride of Iron.....	½ oz.

3. Wash the article in clean water and immerse in the nickel solution. Deposit the nickel with a current of 3 volts. After five minutes, wash again in boiling water and then dry.

The Cheap Blackening of Brass.

The following solution for blackening brass is nothing new and, in fact, it has been known for a long time. Owing to its cheapness, ease in working and adaptability for many purposes it has been deemed advisable to bring it again to notice. Many platers, of course, will recognize it as an old solution known to the plating industry for many years, but have not realized its advantages for some classes of work.

The solution is made as follows:

Water	1 gallon
Sugar of Lead	8 oz.
Hyposulphite of Soda	8 oz.

The solution is used as hot as possible and the brass work simply dipped in it and allowed to remain until black. This takes about a minute or less. The articles are then rinsed in cold water, then in hot water and dried. If scratch-brushed dry, the black deposit will have a high lustre.

When dipped into the solution, the surface of the brass article becomes yellow, then blue and finally black. It should not be taken out until all the surface has become blackened. The deposit on it is sulphide of lead.

The articles should always be lacquered as the black deposit is apt to oxidize and fade if not; but if coated with lacquer, it seems to be quite permanent.

For a cheap class of goods that require a black finish, this solution can frequently be used to a good advantage. It requires no current and is used as a dip. The color, to be sure, is not coal black, but resembles a graphite black more than anything else and has a slight gray shade. It is sufficiently black, however, to answer many purposes and it is so easily applied that it can be used on cheap goods without increasing the cost to any extent.

Fire-gilding is carried out by first making an amalgam of gold and mercury in such a proportion that it is plastic. Then smearing it over the surface of the article to be gilded, and afterwards heating to a temperature that will drive off the mercury. It is the most durable form of gilding and the one that will leave the most gold on the article. Copper, brass or bronze are generally employed as the base metal and the color of the base is made as nearly like that of the gold put on as possible.

Another Flux for Soldering Aluminum.

Another flux for soldering aluminum has been added to the already long list. A new compound for use in soldering this metal has been patented by John J. Natzman of Detroit, Mich. Strictly speaking the flux consists of a mixture of nitric, sulphuric and hydrochloric acids to which rosin has been added. The peculiar method of making this compound is described by the inventor as follows:

"In the formation of my compound I mix nitric, sulphuric and hydrochloric acids preferably in equal proportions, and add to the mixture a small quantity of rosin; I then add an excess of aluminum by inserting a small fragment of metallic aluminum and permitting it to remain until reaction ceases. In a separate vessel I then place nitric acid and add a small quantity of rosin, and in a third vessel nitric and hydrochloric acids in equal proportions, adding rosin to this mixture also. I then combine the three mixtures in equal proportions, the resulting combination being then ready for use.

The surfaces to be soldered are first cleaned with this compound, which may either be applied with a swab or the metal may be dipped in the solution. After cleaning, the adhering liquid is wiped off to dry the surface and a small quantity of powdered rosin is sprinkled on. The cleaned surfaces are then coated, preferably with metallic zinc which may be applied with an ordinary soldering iron. I have found that where the surfaces are treated in the manner above described the zinc will readily adhere to the surfaces, after which the soldering may be completed by the use of any ordinary solder."

Nickel plated goods may be brightened and prevented from tarnishing by the use of a weak pickle after they have come from the nickel plating solution. A pickle composed of 1 gallon of muriatic acid and 4 gallons of water is used and the work left in it for a few seconds. It works better warm. The object is to dissolve any iron oxide film that may be present on the surface and which has formed in the electro-deposition of the nickel. This is caused by the presence of iron in the nickel plating solution.

Cleaning Silverware Without Polishing or Scouring.

The usual method employed in the household for cleaning and polishing silver-ware is by means of a soft cloth and a polishing material such as fine chalk. Some time ago, various inventors patented methods, almost similar, of cleaning silverware by electrolytic action. The silver is immersed in a solution of bi-carbonate of soda and brought in contact with a zinc or aluminum plate. The electrolytic action set up removes the tarnish from the silver and no manual labor is necessary.

POLIVIT
"POLIVIT"
Made in England. British Patent No. 5962[illegible]
A NEW METHOD OF CLEANING AND POLISHING GOLD, SILVER AND ELECTRO-PLATE.
The old plan of cleaning plate is superseded—no more pastes, powders, cloths or brushes. The "POLIVIT"—the new cleaner—does the work by itself whilst you look on. You simply place the Polivit in hot water with a little washing soda, and the articles to be cleaned on it, and as if by magic the dirt flies from the plate to the Polivit, leaving the plate as clean and brilliantly polished as when new.
SMALL SIZE 1/3. STANDARD SIZE 2/6
THE POLIVIT MANUFACTURING CO., LTD.,
1, Orchard Street, Great Smith Street,
WESTMINSTER, LONDON. S.W.

Our English friends seem to have "stolen the march" in the matter, as the enclosed advertisement from an English trade paper will indicate. They are advertising and pushing the method quite extensively in that country, while in this country, the inventors of the process do not seem to have exploited the subject to any great extent. It is believed that the process had its inception in the United States as a number of patents on the subject will bear witness.

"Easing-Up" on the Brass Founders.

Manufacturers of foundry tools seem to have in mind a desire to lessen or "ease-up" the labors of the brass founders, judging from the new forms of hack-saw frames that have

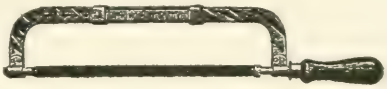


Fig. 1. Ordinary Form of Hack-Saw Frame.

lately appeared on the market. The early form of hack-saw frame and one found in every brass foundry is one with a round handle and is shown in Fig. 1. This has been

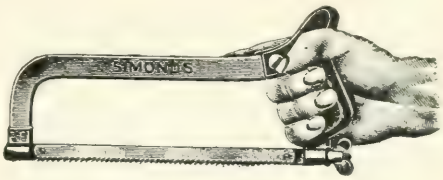


Fig. 2. Simonds Improved Hack-Saw Frame.

used so long that it was thought no other was possible. While good in a way, it tires the hand when used for a long time.

Fig. 3. Disston Hack-Saw Frame.

Hack-saw frames with the new form of handles are shown in Figs. 2 and 3 and it is believed that these forms are logical. They can be used for a long time without bringing

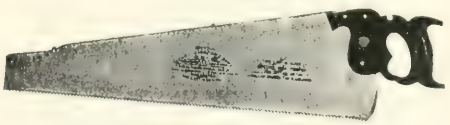


Fig. 4. Hack-Saw in Form of Ordinary Hand Saw.

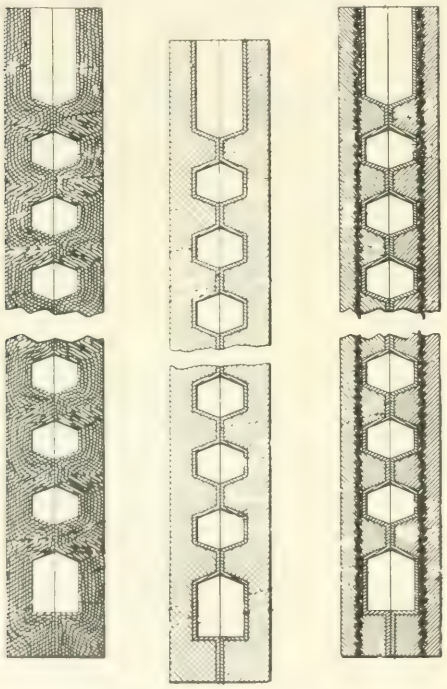
on the fatigue that is produced by the old shape of the regular hand-saw used for wood. This shape is frequently useful for sawing off large risers or gates.

As the hack-saw is to the brass founder what the hammer is to the carpenter, these new forms of frames and saws may be of interest.

Making Automobile Radiators by Electrodeposition.

A process of making automobile radiators by electrodeposition has been patented by Frederick A. Feldkamp of Newark, N. J. of the Electrolytic Products Co. The process is novel in that a paper mold is used as a part of the process.

The method used for making the radiators is to first cast a grid of a very fusible metal and then deposit copper on this until the desired thickness has been obtained, after which the fusible metal is melted and allowed to run out, leaving the honeycomb structure necessary.



Mold for Making Automobile Radiators by Electrodeposition.

The mold used for casting the fusible metal grid is made of paper, reinforced with metal to hold it in shape. The paper, the inventor states, allows the metal to cool without strains or local shrinkage spots that would interfere. The employment of a very fusible metal, allows a low temperature to be used in pouring and the paper is not affected. The mold is used over and over, like a metal mold.

The fusible metal is plated with copper in a usual copper solution until the desired thickness has been obtained, the metal melted and run out and the radiator section left. The copper may be plated with nickel or other metal if desired.

The National Electroplaters' Association.

The fifty-second meeting of the National Electroplaters' Association was held in New York City on July 26th, with President R. H. Sliter presiding. Thirty members were present and one new member was elected.

Some fifty different finishes on novelty work were exhibited by Thomas Haddow and a description of the method of producing is to be given at a later date.

Among other matters, a discussion upon cyanide copper solutions, ammonia copper black, arsenic black and spotting-out took place and made the meeting of much interest. It was decided to establish a question box for the benefit of such members as may be timid about asking openly. The next meeting will be held on August 23rd.

A New Method of Preventing Blowholes in Castings.

The presence of blowholes in brass or bronze castings is the greatest difficulty encountered in the casting of these metals in sand. According to an English inventor, it may be prevented by casting the metal in a vacuum. The formation of these blowholes is prevented, he says, by making a system of minute passages or vents on the molding sand, sufficient to allow the air or gases to escape, but not the metal, and communicating with a large vacuum chamber, by means of which the air and gases may be withdrawn from the mold during casting.

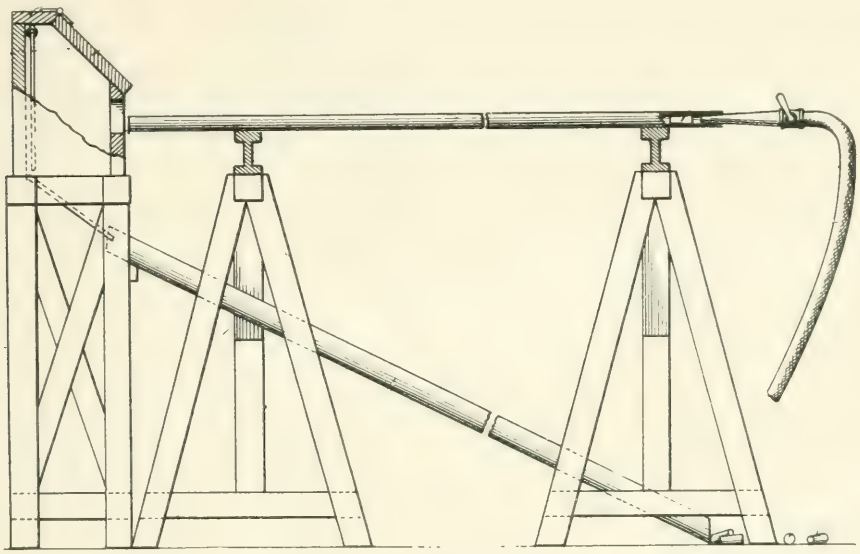
The mold is suitably enclosed, the molten metal being introduced from a vessel rotatably mounted upon it; and the vacuum chamber is provided with a trap for preventing the ignition of explosive gases which may be withdrawn from the mold.

Metallic cerium is a white metal, resembling iron in color, and tin in hardness. It may readily be rolled into sheet or drawn into wire. Its specific gravity is 6.92, or about that of zinc. It melts at 635° C. (1175° F.) or at practically the same temperature as that of aluminum.

Removing Scale from Iron Pipes Previous to Tinning or Galvanizing.

A method of removing the scale from iron pipes previous to tinning or galvanizing has been devised and patented by John E. Jones of Struthers, Ohio. The method is rather novel and is carried out in the following manner:

The pipes are placed on a stand and a steel plug is inserted in one end. The end is then connected with a nozzle through which air under high compression is forced. This serves to drive the plug through the pipe and remove the scale. A target is placed at the rear end of the pipe to retain the plug so that it can be used over again. A pipe connecting with the target serves to conduct the plug back to the operator.



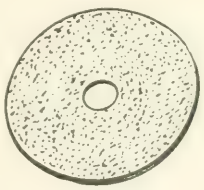
Method of Cleaning the Pipes.

Nickel plating may be done without the use of the electric current by immersing the articles in a solution of 1 gallon of water containing 8 oz. of double nickel salts and 8 oz. of sal-ammoniac. Pieces of aluminum are then brought in contact with the articles and the nickel is deposited. This process is not used commercially and has no advantage over the deposition by the current.

Lubricating Grinding Wheels.

One would naturally believe that to lubricate a file or a grinding wheel would be foolishness, but Joseph I. Hatch of Philadelphia, Pa., has recently patented a process for improving abrasive wheels which would seem to offset this idea. His process is applied more particularly to the cloth or paper abrasive wheels which are used in the form of disc grinders, etc.

The method consists in impregnating the paper or cloth wheel with paraffine or similar material. The impregnating is done hot so as to completely penetrate the material. It is claimed that this method, when applied to wheels for grinding gold, silver or platinum,



greatly reduces the amount of dust formed and much of it is retained by the wheel. The grinding is also performed with much greater ease. The fact that the wheel is waterproof allows grinding to be done in presence of moisture when necessary.

Questions and Answers.

QUESTION No. 1169. We have been making a worm gear casting of the following mixture and the weight of the gear is about 2000 lbs. We find that, while the casting has a nice appearance, the teeth break after a hard service of about two or three days:

Copper	89.5 lbs
Tin	9.0 lbs.
15% Phosphor Copper..	1.5 lbs.

The copper we are using is what is known as "ingot casting copper." Do you think the copper is at fault or the amount of phosphor copper we are using is too much?

Answer. The amount of phosphor-copper you are using is not too much and we should that that the copper may be at fault. Casting copper is apt to contain impurities such as arsenic, sulphur, antimony, etc., which have a tendency to weaken the bronze. We advise using a good grade of electrolytic copper. The amount of tin you have is not too much for a bronze gear.

QUESTION No. 1171. We have an order to make a quantity of valves out of cheap, white metal, and while molds are not complete, we tried them out, as our customer is patiently waiting for the goods. We have found that the metal does not run up full, as you will notice by the sample we are sending you. Kindly inform us what low price metal we should use for this work? The mold is of brass. Would you advise oil the molds or putting some other material on the surface of it? These valves must be very cheap or they cannot be used.

Answer. From the same you are sending us, we should say that your difficulty is in the metal. It is very soft and seems to be almost pure lead. This would not do for anything of the nature you are using as it is too soft; and it is likewise a poor casting material. It is customary to mix antimony with it. Use the following:

Lead	87%
Antimony	13%

This is the mixture almost universally employed for making coffin hardware, soft metal novelties and a large variety of articles cast in metal molds. Do not put anything on the surface of the molds, but oil them and then heat them in the fire to burn it off, after which a good surface will be left. The mold should be slightly warm when used, but not too hot. It is customary to cool it down when it becomes too hot from frequent use, by immersion in water.

QUESTION No. 1174. In the May issue of THE BRASS WORLD on page 180, there is an article concerning "Roseleur's Tinning Solution for Small Steel Goods." We have experimented with it, following the directions given in the article, but do not obtain the coating of tin which this solution is supposed to deposit. Can you give us further information?

Answer. The tinning solution mentioned is composed of tin-salts and ammonia alum. Potash alum will not work. Possibly your difficulty is this. Be sure you obtain ammonia alum. The tin deposit obtained is very light and is suitable only for a very limited class of work. If the surface upon which the tin is placed is not bright, the tin deposit will not be bright. The solution works as well as could be expected as a dip and we believe you will find it satisfactory for small goods, such as tacks, nails, pins etc. It is not adapted for other work.

QUESTION No. 1175. In the May issue of THE BRASS WORLD, the use of boron for purifying sterling-silver is mentioned. Can this be obtained and would it be advantageous in our work? We make sheet sterling silver and this is manufactured into novelties by us. We use trolley wire for the copper in the sterling and have found it satisfactory. It is more convenient than any copper we can use and we can purchase it at the price of scrap. Our trouble is that when the silver is rolled, blisters develop.

Answer. We are unable to give you much information about the use of boron in sterling-silver. It has not yet been placed on the market and we are unable to advise you where it can be obtained. It is said to give good results in deoxidizing and purifying copper, and as it is the copper in sterling-silver that causes the most trouble, it is quite probable that boron will likewise act beneficially in silver and copper alloys.

QUESTION No. 1177. I have been using a solution for tinning composed of 1 gallon of water, 1 oz. of tin chloride, 1 oz. of caustic potash and 5 oz. of potassium cyanide. It deposited a good coat of tin for a few days and then I did not use it for several weeks. I could not obtain any deposit then. What is the trouble?

Answer. As practically no tin comes from anodes (and none at all when steel or other anodes are used), you will have to replenish your solution when it becomes deficient in tin. Add tin salts to it when it does not deposit well and you will have no trouble. You had better dissolve the tin salts in potash when added as this procedure will prevent the neutralization of the cyanide in the solution.

QUESTION No. 1178. Is molybdenum used to any extent in the non-ferrous metal trades in making alloys or purifying metals?

Answer. As far as we know, molybdenum is not used in non-ferrous metallurgy at the present time. It may have advantages in the making of special alloys, but if used, makers are keeping it a secret.

QUESTION No. 1179. We have a thin walled hemisphere of brass to cast and which varies in diameter from fourteen up to thirty-one inches. We coat these molds, used for casting the hemisphere, with graphite and then

bake them for a considerable length of time in order to prevent scabbing. The sand we used is rather heavy and upon baking a very firm mold is obtained. Is there any method we can use or facing that we can put on the mold which will prevent the scabbing if we do not dry the mold? In other words, is it necessary to use a dry sand mold?

Answer. While we do not know the exact shape of your casting, we presume that the walls are so thin that the metal will not run in green sand. Dry sand is very satisfactory for thin work of this kind and we doubt whether you will be able to dispense with its use. The danger of a green sand mold in washing, or the metal chilling before the casting has filled the mold, is such that there is always the element of uncertainty in a mold of this description. You will find a dry sand mold the most certain and satisfactory. The only alternative we can offer is to skin dry the mold, instead of baking it clear through, as this gives it some of the properties of dry sand. You can easily try it, but we fear you will not find it as safe as a mold dried clear through, as you are now doing it.

Question No. 1180. We have used the formula for a black nickel solution as given on page 56 of The Brass World, Feb. 1912, but find the deposit brittle. It is black and otherwise satisfactory, but keeps chipping off. What can be done to overcome this chipping, or in other words, how can the black nickel deposit be softened?

Answer. The difficulty is that you are putting on too heavy a deposit. The black nickel is not a metal, but contains sulphide of nickel and it is, therefore, brittle. If, however, you use a thin deposit, it will not chip or peel. When you have obtained the desired black color on the work, and it is uniform, do not deposit any more. A heavy deposit, such as you have put on, will always peel.

Question No. 1181. We use a pure nickel tubing, about 0.023 outside diameter and 0.006 walls, which we draw down to smaller size, some as small as 0.014 in. in diameter. This material when drawn becomes almost as hard as tempered steel, but the last shipment of tubing we received seems to remain soft even after drawing. Is there anything you can suggest to harden this material other than drawing?

Answer. There are only two ways in which you can harden the nickel tubing: First, by drawing with the greatest reduction. Second, by having the nickel hard at the start. The reason, we presume that your nickel tubing is harder in one case than another, is that the nickel is harder in the one instance than another. If the nickel is harder in one case than another, then the final tubing, after drawing will be harder. While a sample of nickel may appear as soft as another lot, it will, on account of the rapidity with which it hardens during the drawing, become much harder at the final drawing than the other lot.

Question No. 1182. What should a brass solution register by a hydrometer? We want it to work with the greatest economy. We operate quite a quantity of solution, but it seems to take an extra large quantity of cyanide. What is the best strength by the hydrometer?

Answer. The strength of a brass solution will depend upon whether your work is plated in barrels or in a still solution, and whether it is old or new. A good strength for a new brass solution is about 15° Beaumé, but if new, it can be run less. If for barrel work it should be stronger, say 20° or more. An old solution should be stronger than a new one for the reason that it is full of inert and useless salts which cause the hydrometer to rise, but have no plating effect. It may be said that 15° Beaumé is a good "all around" strength.

Question No. 1183. Can you give us any information about operating a solder mold? We have a first class mold, but are unable so far to secure successful results.

Answer. To make a good bar of solder depends upon several things: First, the metal must be good and free from zinc, copper, iron or other impurities which cause the surface to come rough. Oxidized or burnt metals (the tin and lead) will also produce a dirty solder bar. The heat of the mold also influences the appearance of the bar. It should not be cold or the metal will not run freely, and if too hot, the bar cools so slowly that it is not satisfactory. The mold should be cooled in water from time to time. The heat at which the solder is poured likewise has an influence on the appearance of the cast bar. It should be poured at as low a temperature as possible and still have the metal run well. Which of these causes is yours will have to be determined by yourselves as we have not seen a bar of the solder you are making.

Question No. 1189. We want to add a very small quantity of aluminum to a copper and tin mixture. This amount is about 2 oz. of aluminum to 100 lbs. of the copper and tin. How can it be introduced to the best advantage?

Answer. The best way is to make a mixture of tin and aluminum as follows:

Tin	9 lbs.
Aluminum	1 lb.

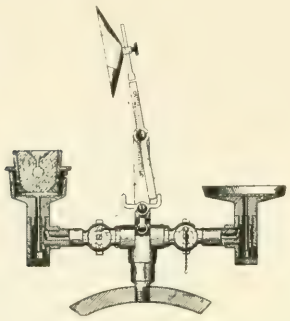
Melt these together and pour out into ingots. Then cut up for use. For every weight of aluminum to be used, take ten times the amount of this tin and aluminum alloy, and deduct the same amount from the tin used. For example, if you want to use 2 oz. of aluminum, then take 20 oz. of the tin and aluminum alloy, and use 20 oz. less of tin in the mixture.

Question No. 1186. I have been using liver of sulphur for producing antique-bronze on wire cloth, but although it produced the right color, the black cracks off when dry. What is the reason for it and what can I do to stop it?

Answer. Your difficulty is that you are either using your solution too strong or leaving the wire in it too long. This produces too heavy a coating which will scale off. Use about 3 oz. of liver of sulphur to the gallon and as soon as the right shade has been obtained, remove and rinse.

Patent Abstracts.

1,030,868, July 2, 1912. VACUUM CASTING DEVICE. Reuben C. Brophy of Elgin, Ill. Assignor to the Ransom & Randolph Co. of Toledo, Ohio. A device for casting small quantities of metal by means of a vacuum. The metal is melted in the top of the mold



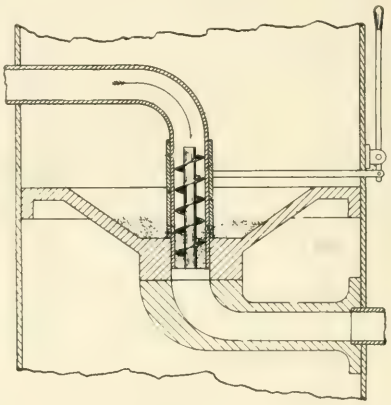
and when molten, is drawn into the mold by suction. This is performed by opening a valve connected with the vacuum chamber. An automatic device for placing the cover on the mold when the valve is opened is also a part of the apparatus.

1,031,000, July 2, 1912. FORMATION OF THE ENDS OF TUBES FOR DRAWING PURPOSES. Henry Higgin of Newport, Ky., Assignor to the Higgin Mfg. Co., of the same place. A method of forming the end of tubing that is to be drawn and so that it may be

gripped with certainty and drawn through the die. The method of forming, by folding over upon itself, and then flattening, may be understood by referring to the illustration.

1,031,026, July 2, 1912. PROCESS FOR THE CLOSING OF THE SEAMS OF TUBES BY MEANS OF ELECTRICAL RESISTANCE WELDING. Ernst Presser of Berlin, Germany. Assignor to the Gesellschaft für Elektrotechnische Industrie. A method of welding the seam in a tube made of sheet metal. This is difficult by means of the ordinary apparatus on account of the varying resistance of the joint, but with this device it becomes possible. The form of the apparatus used can be understood to the best advantage by consulting the full patent specification.

1,032,777, July 16, 1912. SAND BLAST APPARATUS. Ludwig Sauer of Kitzengen, Germany. The feature of this invention lies in the means for preventing the pipe, through which sand is transmitted, from becoming clogged. Applied to sand carried far and is

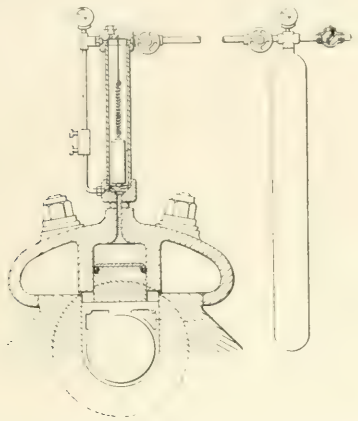


accomplished by dividing the compressed air into two streams, one of which flows in a straight line and the other in a helical path. The sand is supplied in the helical path. By the use of this apparatus it is possible to conduct the sand a long distance.

1,030,290, June 25, 1912. COMPOSITION OF MATTER FOR USE IN REMOVING GREASE FROM MOLDS USED IN THE ART OF ELECTROTYPING. In electrotyping, the form is made by pressing the material to be reproduced into wax. This is then coated with graphite and the copper electroplated upon it. The presence of grease upon the surface interferes with the perfect reproduction of the object, and to guard against it, the wax form is dipped or washed with the following solution: Methyl Alcohol, 8 quarts; Chlorine water, 3 pints; Sodium chloride (saturated solution), 1 quart; hydrochloric acid, ¼ pint; and water, 1 quart. This solution, it is stated, removes the grease or oil from the surface of the form.

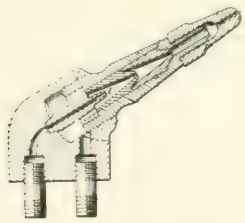
1,031,257, July 2, 1912. PROCESS AND APPARATUS FOR EXTRACTING AND REFINING METALS AND ALLOYS. Albert E. Green of Chicago, Ill. A furnace in which gaseous and electrical treatment may both be used. The object of this is to partially melt or refine the metal by gas or oil, and then finish by means of the electric current.

1,030,865, July 2, 1912. ROLLING MILL. John Holmes Blakesley of London, England. The object of the device is to render the rolls more resilient and less liable to be broken. The apparatus consists of a ram actuated by compressed air and which acts upon water



operating another ram directly upon the bearing. In this manner a resilient device is obtained which acts as a cushion when the rolls are used, and prevents breakage by sudden and excessive pressure.

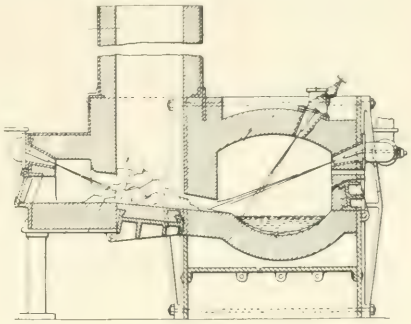
1,032,431, July 16, 1912, APPARATUS FOR WELDING MEATLS. Eugene Raven Rosenbaum of New York City. A blowpipe for welding metals by means of oxy-acetylene or other gases. The improvement consists in the



method of regulating the supply of gases and the means for changing the size of the outlet at the tip through which the gases pass. The principal object is to provide a burner in which the entire mechanism, including the mixing chamber, is included in the head.

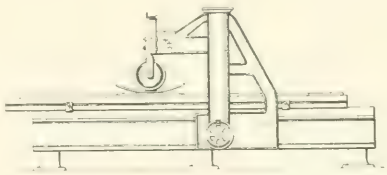
1,031,572, July 2, 1912. MULTIPLE WIRE DRAWING MACHINE. Walther Nacken of Erlau, Germany. A continuous and multiple wire drawing machine, the novelty of which is in the immersion of the drawing cones and dies in oil or lubricant and provided with a separate cooling arrangement. The abundant lubrication of the dies thus allows greater speed in drawing.

1,032,745, July 16, 1912. SMELTING FURNACE. Wallace H. Dow of Piedmont, Cal. A reverberatory furnace for melting metals and in which oil is used as the fuel. The metal is placed upon the hearth and the oil flame



plays upon it, melting it and causing it to run down into the bottom, from which it is tapped out. A number of burners are used and which are directed in different directions to keep the metal from chilling.

1,032,907, July 16, 1912. APPARATUS FOR DEFORMING SHEET METAL PLATES. George H. Hyde of Watertown, N. Y. Assignor to the Hyde Metal Boat Co. A method of forming sheet metal in a curved manner by



passing a roller over it while resting upon a suitable bed plate. A convex supporting bed is used and this is the feature of the invention. It is claimed that this convex bed allows the curvature to be obtained in a better manner.

1,032,438, July 16, 1912. METAL HARDENING COMPOUND. Eli Sweet of Binghampton, N. Y. The compound consists of the following: Crude petroleum, 1 gallon; kerosene, 1 quart; palm oil, 4 oz.; and Atlantic red, 2 oz. The steel is quenched in the compound and it is claimed that it becomes hardened to a greater depth and with less danger of cracking.

1,030,090, July 2, 1912. WIRE STRAIGHTENING AND CUTTING OFF MACHINE. Elmore F. Shuster of New Haven, Conn. An improved machine for straightening wire and cutting off to specified lengths. The improvement is in the cutting-off and feed-roll mechanism.

Trade Items.

The McNab & Harlan Mfg. Co. of Paterson, N. J., manufacturers of brass and iron steam goods, have increased the capacity of their galvanizing plant. They have also installed a new steam testing plant for testing valves.

In twelve years, the automobile industry has risen to third place in importance among the manufacturers of the United States. With the exception of the home market, Canada is the best customer.

The American Manganese Bronze Co., Holmesburg Junction, Philadelphia, Pa., manufacturers of manganese-bronze castings, are contemplating building a new foundry at their plant and which it is expected will be 50 x 120 feet.

A brass and aluminum foundry is being erected in Detroit, Mich. by the General Aluminum & Brass Castings Co. at East Grand Boulevard and St. Aubin Ave., Detroit, Mich. This foundry will be 120 x 200 feet and a specialty of automobile castings will be made.

The plant of the Triumph Mfg. Co. at Detroit, Mich., manufacturers of motorcycles, is now in operation and some 2000 machines are now passing through. The plant is located at 51 East Woodbridge St. The plant is equipped with a modern and extensive nickel plating department and an adequate polishing equipment.

The brass foundry of the Bethlehem Steel Co. at South Bethlehem, Pa., is to be enlarged and will then contain 19 furnaces with a capacity of 700 lbs. each and giving the plant a daily capacity of 26,600 lbs. The present round type furnaces are being discarded and square furnaces are being installed. The gray iron pattern shop is to be moved to another location to make room for this enlargement. The enlarged foundry will be 110 x 240 feet.

The Basic Mineral Co. of Pittsburgh, N. S. Pa., announce that they will shortly incorporate their company and increase its plant. A Chicago office will be opened and will be in charge of J. B. Huling. Philip Pastre is the resident manager of the Pittsburgh plant. C. M. Miller, the general manager will shortly move to New York City and will, as in the past, superintend the compounding. The company reports a rapidly growing business.

The United Foundry & Machine Co., Bridgeport, Conn. are now in full operation and the manufacture of brass, bronze and aluminum castings is now being carried on in an extensive manner. A specialty is being made of aluminum castings for automobile work and some of the largest automobile manufacturers are their customers. They are also making a specialty of bearing bronzes and aluminum-solder made after their own formulas. Jobbing work of all kinds is solicited. The new and extensive foundry being erected by them is well under way and will, in the near future, be ready for occupancy.

A factory is to be built at Norwich, Conn., by the American Thermos Bottle Co. Several large buildings are to be erected.

The Watrous Mfg. Co. has been incorporated in Des Moines, Iowa, with a capital stock of $30,000 to manufacture hardware and metal specialties. The directors of the company are David B. Gann, Henry E. Colton and Frederick Secord.

The Detroit Battery & Ignition Co. has been incorporated in Detroit, Mich. with a capital stock of $200,000 to manufacture batteries, lamps and other automobile specialties. This new company has absorbed the American Ignition Co. and the Knop Battery Co.

A new plant is to be erected by the Heinze Electric Co. of Lowell, Mass., at a cost of $20,000. This will adjoin the present plant on Lawrence St. The manufacture of spark coils and other electric specialties are manufactured. The new factory will be 60 x 120 feet and four stories high.

The Estate of P. D. Beckwith, Inc., of Dowagiac, Mich., manufacturers of the "Round Oak" stoves is erecting a new building to replace a portion of their old factory. This is the last portion of the old factory to be rebuilt. All the rest has been replaced within the last five years.

The production of spelter in the United State during the first six months of 1912, is stated by the Geological Survey to have been 159,952 short tons made from domestic ores, and 6,544 tons made from foreign ores. This is 26,300 tons more than for the first half of the year 1911. Two new plants under construction at Hillsboro, Ill. with 5,800 retorts, will go into operation soon after October 1st. The annual output per retort is about 4½ tons.

The Treadwell Engineering Co., of Easton, Pa., has prepared a card for distribution showing the coloring recommended for patterns adopted by the joint meeting of the American Society for Testing and the Steel Founders' Society. Black is recommended for core prints, red is used for finished surfaces and yellow for rough surfaces. It is expected, therefore, that the general adoption of this method of coloring patterns will greatly assist the founder in determining what surfaces are to be finished.

Owing to the enormous increase in the consumption of petroleum products in various parts of the world, a demand has arisen for men qualified to conduct this important branch of mining and refining. The University of Birmingham (England) has, for some years, provided special courses in petroleum mining. This course is to be enlarged and a special degree conferred upon graduates who have taken it. It is stated that those who have taken this course are now holding important positions in the petroleum industry.

Wm. H. Bixby & Co. has been organized in Providence, R. I., for the manufacture of jewelry. A factory has been started at 151 Pine St. in that city and a line of plated jewelry will be manufactured.

The Ecothermal Stove Co. has been incorporated in Warren, Ohio, with a capital stock of $150,000 to manufacture stoves. A plant was established some time ago in that city for manufacturing and the company has now incorporated.

The Pennsylvania Flexible Metallic Tubing Co., 1305 Arch St., Philadelphia, Pa., manufacturers of flexible tubing of brass, steel and other metals, are to erect two new buildings at a cost of $8,000. These buildings will be 23 x 82 feet and 38 x 82 feet.

The Jackson Rim Co. has been organized in Jackson, Mich., with a capital stock of $100,000 to manufacture automobile rims. The incorporators are Otis W. Mott of Utica, N. Y., Winthrop Withington and Mark Merriman of Jackson. A factory will be equipped for manufacturing. Electrogalvanizing will be carried on.

The property and plant of the Consolidated Casting Co. of Mechanicsville, N. Y., will be sold at auction on August 19, 1911. This plant is fully equipped for the manufacture of stove trimmings and comprises a nickel plating plant and foundry. The company went into the hands of a receiver some time ago and the sale is by order of the Court.

Vanadium compounds are now being used in medicine and the Vanadium Chemical Co., Vanadium Building, Pittsburg, Pa., are now manufacturing them for the trade. These compounds consist of Vanadiol, Phospho-Vanadiol, Vanadoforme and Vanadioseptol. The Vanadium Chemical Co. is a concern affiliated with the various concerns producing vanadium and its alloys in Pittsburgh, Pa.

The Haydenville Company of Haydenville, Mass., manufacturers of plumbers' brass goods, have purchased the Bay State Brass Co. of the same place and manufacturers of the same line of goods. The Bay State Brass Co. were an outgrowth of the Haydenville Company, and recently went into the hands of a receiver who continued and reorganized the business. The Bay State Brass Co. will be continued in business by the Haydenville Company, but under separate management.

The Abbott Ball Co. of Hartford, Conn., manufacturers of steel balls for burnishing small metal goods by tumbling, and the Abbott tumbling barrel for use with the steel balls, have moved to their new factory in Elmwood, Conn., near Hartford, where a new and model plant has been built. Their facilities for manufacturing is now excellent and goods can be shipped with greater facility and promptness. This company manufacture steel balls exclusively for tumbling purposes and they are produced with a special hardened, ground and polished surfaces. The mail address of the company remains at Hartford as Elmwood is a suburb of this city.

The Graf Stove & Range Co., of Louisville, Ky., has been incorporated with a capital stock of $100,000 to manufacture stoves and ranges. The officers are: President, Henry J. Graf; secretary and treasurer, Theodore H. Graf.

Four new buildings are to be erected by the King Sewing Machine Co. of Buffalo, N. Y. They will be as an addition to their plant on Rano and Welland St. Foundry equipment, it is stated, will be needed in addition to other material.

The Globe Automatic Sprinkler Co. of Cincinnati, Ohio, manufacturers of automatic sprinklers, have leased the H. C. Hazen plant on Reading Road in that city and will commence manufacturing as soon as equipped. The equipment is being purchased.

Vice-Consul General H. M. Sanford, of Ottawa, reports that as compared with the first thtree months of 1911 silver production in Canada shows an increase of $383,861 in the first quarter of 1912, though the quantity itself was less by 91,4[illegible] ounces. Cobalt proper produced 7,006,842 ounces, South Lorrain 285,042 ounces and Gowganda 147,103 ounces.

The Page-Hersey Iron, Tube & Lead Company, Ltd., of Welland, Ont. Canada, are enlarging their plant in that place. Iron and lead pipe and plumbing goods are made.

The capital stock of the National Spring Bed Co. of New Britain, Conn., is to be increased from $100,000 to $150,000. Tinning is carried on by this company.

Owing to the difficulty of keeping track of the wastes in using a large crucible, the United States Assay Office in New York City, will in the future use individual crucibles. In this manner it is hoped that individuals will be able to obtain a share of the "clean-up" when it occurs at the end of the year. Those who have gold refined at this office have, in the past, not been able to obtain satisfactory allotments of the "clean-up"; and it is now expected that the gold and silver obtained when the old crucibles are broken up and the gold in them determined, can be returned to the proper individuals who have the material sent in for refining.

The New England Watch Co. of Waterbury, Conn., manufacturers of medium priced watches, have gone into the hands of a receiver and J. P. Elton of the American Brass Co. of Waterbury, Conn., and Harris P. Whittemore of Naugatuck, Conn., have been appointed receivers. It is stated that the cause of the difficulty was the change in the movement of the watches from the duplex to the more modern lever escapement. This company is the successor to the old Waterbury Watch Co. which made the first cheap watch known as the "Waterbury" and with which every one is familiar. The company, however, began the manufacture of better grade of watches and was obliged to change their name to offset the reputation gained in the manufacture of the first cheap watch. The company will be reorganized and the business continued.

The plating room of the Creamery Supply & Mfg. Co. of Clinton, Wis., was recently damaged by fire to the extent of $15,000.

A factory is to be erected by the Payson Mfg. Co., 2918 Jackson Boulevard, Chicago, Ill., manufacturers of builders' hardware.

A site has been purchased by the Nationel Electric Lamp Co., Hough Ave. and East 45th. St., Cleveland, Ohio and a plant will be erected.

A foundry and factory will be erected by the Canadian Lock & Novelty Co. of New Westminster, British Columbia. This will be built at Edmonds, B. C.

The plant of the F. H. Lovell Co. at Arlington, N. J., manufacturers of lamps and marine hardware, was recently damaged by fire to the extent of $100,000.

The Detroit Fuse & Mfg. Co., of Detroit, Mich., manufacturers of electric fuses and specialties, are to erect an addition to their factory on Rivard St., near Piquette Ave., in that city.

The Schilling Mfg. Co., of St. Paul, Minn., are to establish a branch plant in Winnipeg, Manitoba. Household ware, such as coffee and tea urns, bake ovens, steam tables etc., will be manufactured.

The Newell Mfg. Co., of Ogdensburg, N. Y., manufacturers of brass upholstery and curtain hardware, are to erect a new factory building at their plant. It will be one story high and 100 x 140 feet. It will be used as a machine shop.

The Russell Motor Car Co. of To onto, Canada are to build a new five story factory in that city for the manufacture of automobiles. It will be located on North Keele St. The cost will be in the neighborhood of $75,000.

The plant of the Detroit Seamless Tube Co. of Detroit, Mich., manufacturers of seamless steel tubing, was recently destroyed by fire with a loss of $300,000. It is yet undecided whether the plant will be re-built in that city.

The Reynolds Aluminum Co. has been incorporated in New Washington, Ohio with a capital stock of $10,000. The incorporators are F. W. Reynolds, Edward Geissman, J. A. Jacobs, H. M. Kibler and J. H. Donaldson.

The Castle Lamp Co. of Amesbury, Mass., manufacturers of automobile lamps, are moving their plant to Battle Creek, Mich., where a plant will be established and the Amesbury factory discontinued. This company are successors to the old Atwood Mfg. Co. and the Atwood-Castle Co.

The Globe Plating Co. has started in business in Providence, R. I., and will carry on plating and coloring. The factory is at 40 Clifford St. in the quarters formerly occupied by Dodge & Adams. The company is composed of M. J. Casey and W. J. Casey.

The Williams & Anderson Company of Providence, R. I., manufacturing jewelers are enlarging their coloring room and adding additional apparatus.

The Sterling Vacuum Cleaner Co. has been incorporated in Sebring, Ohio with a capital stock of $10,000 to manufacture vacuum cleaners.

The Rundle Mfg. Co., of Milwaukee, Wis., are building a three story addition to their plant. It will be used for the manufacture of their line of plumbers' brass goods.

The Sterling Brass Co. of Cleveland, Ohio are to manufacture a standard line of plumbers' brass goods. The new plant of the company is located at 47th. St. and St. Clair Ave.

The Dell Manufacturing Co. of Cleveland, Ohio, manufacturers of metal stampings, are to erect a new plant at 684 East 82nd St. in that city.

The Wright Mfg. Co., has been organized at 70 Morris Ave., Newark, N. J., with a capital stock of $100,000 to manufacture metal novelties.

A two story building is to be erected by the Frank Bros. Iron & Metal Co., 255 Hastings St., Detroit, Mich. It is to be 50 x 127 feet with basement.

The Standard Brass Co., of Detroit, Mich., are building a two story brick building on Wight St., near McDougall St. This factory will be 92 x 166 feet and will cost $24,000.

The Herschede Hall Clock Co., 1011 Plum St., Cincinnati, Ohio, manufacturers of hall clocks, are to increase their plant by the addition of new machinery.

The equipment of the Wadsworth Watch Case Co. of Dayton, Kentucky, is to be increased by the purchase of new machinery. Watch cases are manufactured.

The Cleveland Brass Mfg. Co. has been incorporated in Cleveland, Ohio with a capital stock of $150,000 to manufacture brass goods. M. F. Barrett, W. H. Smith and Charles Higley are the incorporators.

The William A. Hardy & Sons Co. of Fitchburg, Mass., brass founders and manufacturers of screen plates for paper mills, are to increase their plant by the addition of a brick building.

A new factory is to be built by the New Hamburg Electrical Appliance Co. of New Hamburg, Ont. Canada, to manufacture electrical appliances. The cost of this plant will be $30,000.

So far as known, there is no bismuth ore mined in the United States. An ore in Colorado is mined that contains from 6 to 8 per cent of bismuth, but this is sold for its gold and silver contents. In 1911, the imports of bismuth amounted to 172,093 lbs., valued at $311,771.

The Hendee Mfg. Co. of Springfield, Mass., manufacturers of the "Indian" motorcycle, and one of the largest manufacturers of this class of goods in the United States, are to add new buildings to their plant which will greatly increase their output. It is expected that 400 additional hands will be employed and the output of motorcycles increased to 35,000 per year.

The Shepherd & Shellhorn Company has been organized in Evansville, Ind., with a capital stock of $10,000 to manufacture stoves.

The Austin Automobile Co. has been organized in Grand Rapids, Mich., with a capital stock of $500,000 to manufacture automobiles.

A new, three-story factory building, 58 x 123 feet is to be erected by the Waterbury Buckle Co., South Main St., Waterbury, Conn.

The Grasselli Chemical Co. are to install additional machinery for the development of their zinc properties at New Market, Tenn.

The Western States Cutlery & Mfg. Co. of Boulder, Colorado, are to erect a factory in Chico, California, to manufacture cutlery.

The Crane-Hawley Co. of Cincinnati, Ohio, manufacturers of plumbing supplies, are to erect a new factory at a cost of $150,000.

The Rapp Mfg. Co. has been incorporated in Toledo, Ohio with a capital stock of $15,000 to manufacture spark plugs.

The Lumen Bearing Co., of Buffalo, N. Y., is adding a machine shop to their plant on Sycamore St.

A factory is to be established in Chattanooga, Tenn. by the J. M. Hecht Brass Works of Chicago, Ill., for the manufacture of light hardware.

The capital stock of the Chicago-Racine Aluminum, Brass & Iron Works of Chicago, Ill., are to increase their capital stock from $16,000 to $30,000.

The Hamilton Trolley Wheel Company, Ltd. of Hamilton, Ont., Canada, have been incorporated with a capital stock of $60,000 to manufacture trolley wheels.

The Boston Woven Hose & Rubber Co. of Cambridge, Mass., manufacturers of hose and an extensive line of brass hose couplings and fire apparatus, are to erect a new, two story factory in that city at a cost of $30,000.

The Carborundum Company of Niagara Falls, N. Y., manufacturers of carborundum and carborundum abrasive wheels, are to erect two large additions to their plant in that place at a cost of $90,000.

The Hazard Mfg. Co., of Wilkesbarre, Pa., manufacturers of wire and wire cable, including copper wire, both bare and insulated, are to erect a four story addition to their plant which will be used for insulation of copper wire. This addition will be 65 x 75 feet.

A fire of celluloid and lacquer at the plant of the Majestic Mfg. Co. of Providence, R. I., manufacturer of jewelry, caused the death of two firemen, anl serious illness of five others. The burning lacquer and celluloid and the fumes given off were the cause. The damage done amounted to several thousand dollars.

The Cleveland Brass Mfg. Co. of Cleveland, Ohio, which was recently incorporated with a capital stock of $150,000 will take over the Cleveland Brass & Bronze Co. A large addition to their plant at 4606 Hamilton Ave. is being made. The manufacture of plumbers' brass goods is carried on.

The Waterbury Battery Co. of Waterbury, Conn., manufacturers of the Schoenmehl battery, now used almost exclusively for railroad signal work, are to build an addition to their plant. This addition will be 35 x 60 feet.

The United Steel & Wire Co. of Battle Creek, Mich., manufacturers of wire goods and household hardware, are to build a new factory, 35 x 100 feet and two stories high. This company succeeded the Battle Creek Oven Rack Co.

The plant formerly occupied by the Simplex Mfg. Co. of Thompsonville, Conn., which recently went into bankruptcy, has been sold to a new company called the Extensive Mfg. Co., who will occupy the property for the manufacture of stamp affixing devices.

The Vanguard Company of Decatur, Ill., manufacturers of automobile windshields, and brass founders, have begun the construction of a new plant in Detroit, Mich. and will move to that city when it is completed. Two buildings, 90 x 200 feet and 30 x 140 feet will be built.

The Board of Education of Jersey City, N. J., are to establish a brass foundry in that city, in addition to other shop equipment. This will be a portion of the technical high school and an extensive foundry for iron and brass, machine shop, etc. will be installed. It is stated that the equipment will cost from $8,000 to $10,000.

Obituary.

William A. Hardy, the head of the old and well known firm of William A. Hardy & Sons Company of Fitchburg, Mass., died on July 4th, aged 75 years. He was born in Pepperell, N. H. and served his time in learning the brass foundry trade. The present business was started in 1861 and has been carried on ever since. The company is one of the largest manufacturers of brass castings and screen plates in the United States. Mr Hardy was veteran of the Civil war. A widow and six sons are left.

Personal.

Frederick Baldt, Jr., has resigned his position with the Nelson Valve Co., of Philadelphia, Pa. and has been appointed superintendent of the plant of the Keystone Steel Castings Co. of Chester, Pa.

James E. Pope, president of the New York Metal Exchange, has resigned and his resignation has been accepted. A. B. Hall, of the National Lead Co., the vice-president of the exchange is now acting president.

Charles F. Bliss has been elected president of the Farrel Foundry & Machine Co. of Ansonia, Conn., to fill the vacancy left by the death of Franklin Farrel. The other officers elected are: Vice-president, Franklin Farrel, Jr.; Secretary, Frank E. Hoadley, and Alton Farrel, treasurer.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.24
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia, 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.08⅝
Arsenic, Metallic	lb.	.10
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.50
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitrol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.10
Chrome-Green	lb.	.50
Copper, Lake (carload)	lb.	.17⅝
Copper, Lake, (cask)	lb.	.17⅞
Copper, Electrolytic, (cask)	lb.	.17⅝
Copper, Electrolytic, (carload)	lb.	.17⅞
Copper, Casting, (carload)	lb.	.17⅜
Copper, Casting, (cask)	lb.	.17⅝
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Corrosive Sublimate, see Mercury Bichloride.		
Cream Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Flour Spar	lb.	.01¼
Fuel Oil	gal.	3.50
Gold Chloride	oz.	11.75
Gold, Pure	oz.	20.87
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iridium	oz.	62.50
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	1.16
Mercury, Metallic (Quicksilver)	lb.	.40½
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.41
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Satpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Cloride	oz.	23.00
Platinum Metallic	oz.	45.50
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic	lb.	.05½
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.08
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.60
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin Metallic	lb.	.41½
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc, Carbonate, dry	lb.	.19
Zinc, Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.07⅛

THE BRASS WORLD AND PLATERS' GUIDE

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Contents for September.

Aluminum Solder 319
Aluminum, Welding 324
Assaying Standards of Russian Silver 320
Brass Foundry Mixtures, Standard 317
Brass, Government Testing of 309
Brass Melting, Use of Salt in 307
Cartridge Factory in Abyssinia 316
Case-Hardening Compound, New 310
Dow Mechanical Plating Apparatus 329
Electric Furnace in Brass Melting 307
Electrotyping, Improvement in 326
Fused-Oil in Argentina 313
Gating for Manganese-Bronze 319
Heating Brass Tubing for Lacquering 325
Hendrick's Commercial Register 321
Manganese-Bronze, Cheap 321
Metal Coloring in Ammoniacal Baths 318
Nickel Plated Rubber 313
Nickel Solutions, Overconcentration in 306
Nickel Works in France, New 309
Platinum and Aluminum, Alloys of 319
Potash Industry in the United States 327
"Promethens" Nickel Salts 318
Pyrophoric Alloys 325
Salts, Melting Points of Various 316
Sherardizing Furnace, Modified 321
Silver, Apparatus for Cleaning 323
Silver Cyanide and its Properties 312
Silver from Photographers Solutions 313
Silverware, Removal of Tarnish from 320
Spotting-Out, Remedy for 311
Sulphuric Acid and Water, Mixing 316
Tungsten, Uses of 328
Vanadium in Chile 322
Washer, The "Eccentro" Balancing 315

The Electric Furnace in Brass Melting.

Up to the present moment, it cannot be said that the electric furnace has made progress in the melting of brass and its kindred alloys. Although a number of furnaces have made their appearance on the market within a short time, brass manufacturers have not yet adopted them to any extent and those which have been installed are for purely experimental purposes and the time does not seem here to say how extensively the electric furnace will enter the brass industry.

The lack of interest displayed by manufacturers in the electric furnace is apparently caused by the lack of a cheap source of current. In order to compete with coke, coal or oil, very cheap current must be had, and unfortunately the average brass manufacturer cannot obtain it.

In changing a method in manufacturing industries, two things must always be taken into consideration:

1. Is the operation going to be cheapened and the quality remain unchanged?

2. Or is quality to be made inferior and the operation cheapened?

Manufacturers of all kinds, and this, of course, includes brass founders and manufacturers, take a lively interest in any improvement in their processes which will result in the lowering of costs. If they do not, then they are not progressive. On the other hand, they will not take any interest in a change that is going to increase their costs, even though the quality of their goods may be enhanced.

If, however, the cost of making their goods is cheapened, and at the same time the quality of the product is enhanced, immediate attention will be given the matter.

At the present time there are practically two electric furnaces on the market adapted for brass making and one of these is made abroad. So far, it may be said that the use of electric furnaces in the brass industry is in the experimental stage, and while it holds out much promise in the future, it would appear now as if the scrap metal trades would adopt the furnace before it has entered the brass industry. Up to the present time, it is believed that the cost of current has been instrumental in holding back its extensive adoption. Therefore, makers of electric furnaces must look to special uses, like the melting of platinum, sweeps, scrap metals of all kinds, before its real adoption in brass melting and mixing has taken place.

Over-Concentration a Danger in Nickel Plating Solutions.

While nickel plating can be carried out in a saturated solution of double nickel salts, it is not advisable to use such a degree of concentration and it is believed that many nickel plating difficulties are caused by the employment of such a strong bath. In this connection it should be known that the danger of using such a strong solution lies not in the fact that it is strong, but that the concentration changes the conditions of electrodeposition and these conditions are not altered to suit the case.

A nickel plating solution standing from 9 to 10 degrees Beaumé is practically saturated and unless heated, there can be no more double nickel salts dissolved. It is a very common occurrence that a nickel plating bath will arrive at this degree of concentration by evaporation on standing. It may have originally been 5 degrees Beaumé and everything was arranged for this strength.

Platers are careful to maintain a constant voltage and it is in this that the real danger will occur in employing a concentrated nickel plating solution. With the solution standing at 5 degrees Beaumé, from 2 to 3 volts may be used. If the solution, through evaporation, has become so strong that it stands at 9 degrees, then at the same voltage nearly double the quantity of current will pass. This means that the current density is greatly in excess and the nickel deposit is burned. The whole subject follows Ohm's Law in that with increase in the conductivity of the solution and the maintenance of the voltage at the same amount, the amperage or quantity of current passing must correspondingly increase. In other words, the quantity of current increases as the nickel solution becomes stronger.

The effect of increasing the current is well known to platers and results in the "burning" of the deposit or, if it falls short of it, to produce an off-color nickel plate. To be sure, the condition can be arranged satisfactorily by changing the resistance so that the amperage is the same for the strong or the weak solution, but this is bothersome and cannot be done in practice with any degree of precision. The best method by far is to keep the solution at a certain degree of concentration (say 5 degrees Beaumé) and always use the same voltage. In this manner the current density will invariably be the same and the amount of amperage passing will be uniform under all conditions.

It will be appreciated, therefore, that the danger in concentration in a nickel plating solution, is not so much in the actual strength of the solution, but in the increased electrical conductivity which completely alters the standard quantity of current that is passing.

Metallic iridium, used so extensively for the points of gold pens, is made from the powder, obtained in the wet way from platinum ores, by heating to a high heat in a sand crucible and then adding stick phosphorus. The iridium, which cannot be melted alone, is thus fused in the form of an iridium phosphide. To remove the phosphorus, the phosphide is heated with lime and the iridium is left in the form of a hard, white mass. It is now so hard that it cannot be filed or cut, and is broken up into small pieces for soldering to the points of gold pens. These small pieces are ground to the right size on a copper disc wheel with emery or carborundum. It is said that an ounce of iridium will make from 5,000 to 10,000 pen points. It has also been found that the iridium, thus prepared, is practically as hard as the ruby. No steel tools can make any impression upon it. At one time much less expensive than platinum, iridium now is worth more on account of the demand for hard platinum in which the iridium is the hardening agent.

The Use and Value of Common Salt in Melting Yellow Brass, Composition and Other Copper Alloys.

There are still many brass founders who do not use common-salt in melting brass, although it may be said that nearly every brass rolling mill, and possiby all, are employing it as a factor or flux in the making of brass. Those who do not use salt, certainly cannot realize its great advantages, otherwise they would at once adopt it. Brass founders frequently say that they have tried it and do not find it of any value. This apparent paradox is caused by not giving the salt a fair trial. One melt will not decide. There is, however, no need of experimenting with it at this late day, for the reason that its value has been demonstrated again and again. Most of the large brass manufacturers have used it for years and are still using it. To them there is no question; and if one will only look at the theoretical considerations, he will likewise become convinced beyond the suspicion of a doubt that common salt has great value in brass melting.

Theory of the Use of Common Salt

When copper is melted it is impossible to keep it free from contact with the atmosphere and products of combustion of the fuel. Could it be done, then the ideal way of melting would be found and there would be no need of common-salt or any other flux. Up to the present time, however, this has not been accomplished and the fact remains that the copper oxidizes during the melting. Gases existing in the products of combustion are also absorbed. Every brass founder knows the meaning and appearance of "burnt-copper". It is that which has either been overheated or allowed to remain in the heated condition for too long a time.

Kind of Skimmings Produced in Melting Yellow Brass and With Common-Salt as a Flux.

To be sure, charcoal is put on the top of the copper when it is beginning to melt, and

this frequently seems to those who melt brass to be sufficient. It is insufficient, however, for removing the oxide of copper and simply as a covering and prevents the copper from coming in contact with the air and products of combustion. Charcoal is good as far as it goes, but it cannot replace common-salt. In brass melting, both charcoal (or its equivalent) and common salt should be used.

The whole theory of the use of common salt in brass melting is that, at a red heat, it breaks up ("dissociates" in the right chemical term) into its constituents metallic sodium and chlorine gas. The chlorine gas escapes and, perhaps, serves its purpose in eliminating such base metals as lead, arsenic, antimony or sulphur, but this portion of the theoretical consideration is not fully understood. The sodium, which is set free at the heat of dissociation of common salt, is the material that does the work. It is well established that metallic sodium has a strong affinity for oxygen and also for other non-metallic elements. It is believed, too, that it will partially remove the gases absorbed by the copper during melting. It is positively known, however, that metallic sodium has an excellent effect on the purification of copper from dissolved oxide or oxygen. So much for the theory of the action of common salt in brass melting.

Early Data on the Subject

While the use of common salt in brass melting has been of long duration, just the exact time when it began to be used is not known. One of the earliest records found on the subject was in *The Chemical News* for 1882, page 80, in which the author, R. Monger gives his results of experiments on the effect of common salt on molten copper. Singularly, however, he applied the use of common salt to the assaying of copper. Probably this fact brought about its employment in brass melting, although it is not quite clear.

R. Monger, as previously mentioned, found that when copper is melted with common salt, the oxide of copper is reduced to metallic copper. It was found by him to be an excellent method of determining the amount of metallic copper in commercial copper or that which is not quite pure. The method was to melt some common salt (sodium chloride) in a clay crucible, and then introduce a weighed piece of copper. The copper melts of course, and when it has remained about 10 minutes, the crucible is allowed to cool, is broken and the button removed, cleaned, washed, dried and weighed. In every case, it was found that the copper lost in weight. This loss in weight always corresponded with the amount of oxygen present. In order to prove that the oxygen is removed from copper in this manner and that the process may be used for assaying this metal, two of the buttons from previous experiements were melted with the common salt for some time and when cooled and weighed, it was found the copper had not lost in weight at all.

Method of Using Common Salt in Brass Melting

As it has previously been demonstrated that the function of common salt in metling copper and its alloys is to remove the oxygen, the question, of course, arises as to the effect of oxygen on brass and other copper alloys. In this connection it may be said when oxide of copper is formed during the melting of copper and to which zinc is to be added, the oxide is reduced by the zinc with the formation of oxide of zinc; and at the same time, metallic copper is formed. In other words:

Oxide of Copper plus Zinc equals Oxide of Zinc plus Copper.

It will be understood, therefore, that the zinc reduces the oxide of copper to metallic copper, and at the same time oxide of zinc is produced. Now the question arises; What becomes of the oxide of zinc? The answer is as follows:

The oxide of zinc formed remains suspended throughout the molten brass and does not come to the top at once. In fact, it takes a long time with several meltings to remove it from the brass. This seems paradoxical but is nevertheless so. The oxide of zinc does not come to the surface in the manner believed, in spite of its light nature.

This oxide of zinc, intermingled with the brass or other copper alloy, acts like so much dirt and weakens the cast metal. In rolling, such brass may crack, or it may not work properly after it has been rolled and is made up by spinning, drawing or blanking. Such brass is full of minute particles of oxide of zinc which prevent the necessary cohesion of the metal itself. One can easily understand, therefore, why zinc, although it has the property of reducing oxide of copper, does not answer all the requirements of a deoxidizing material. The oxide of copper is reduced, of course, but oxide of zinc is left instead, which,

while not as injurious as oxide of copper for the reason that some of it floats to the top and is skimmed off, injures the brass to a great degree.

Working upon this theory, it can easily be deduced that if there is no oxide in the molten copper, there will be no oxide of zinc formed when the zinc is added. It is for this very reason, accordingly, that common salt is valuable and is so extensively employed. The use of salt prevents the formation of oxide or reduces it if it has been formed, and thus removes the disease.

Common salt is cheap and easy to use. The best method of using it is to throw a handful on the copper as soon as it begins to melt and is well covered with charcoal. Stir it in. When all has been melted, a little more can be added and stirred in. Two handfuls are sufficient and if an excessive quantity is used, a liquid mass (molten salt) will be found on the top of the brass when ready to pour. This is not satisfactory for the reason that it is difficult to skim off and is apt to enter the mold with the metal. When the right amount is used, it should give a very pasty slag easily removed by the skimmer in a lump. From one to two handfuls to 100 lbs. of brass will give this condition.

While the best time to add the common salt is when the copper is put into the crucible, lying on the bottom of the crucible at it does, it is apt to attack the crucible itself and cause pin holes.

Resumé.

If common salt is not used in brass melting, then it will be found that the casting, either those made in metal molds or in sand will be dirty, lack strength and ductility and the metal will run sluggishly.

If common salt is used, the brass will be cleaner, have more strength and ductility, and run sharper and better.

New Nickel Works to Supply France with Nickel for Coinage.

In conjunction with the new nickel coinage destined to replace the bronze currency in France a group of French capitalists has formed a nickel-working company in Belgium with $800,000 capital, to be known as the Société des Usines de Nickel de la Nethel.

Government Testing and Inspection of Material for the Naval Service.*

Chemical Composition of Brass.

One of the greatest sources of trouble and delay in obtaining articles of composition material is the failure of manufacturers to meet the chemical requirements.

As it would be inconvenient, and in the case of small valves, impracticable, to cast test pieces attached, and if cast separately from the same melt could not be identified, unless there was an inspector always on hand when such castings were made, it is the practice of the Government to simply require drillings to be taken by the inspector from the finished casting, and analyzed. From long experience at the navy yards in making brass castings of certain mixtures, it is known what are the physical characteristics of these mixtures, assuming that they are made properly by skilled workmen. Also, chemical analysis is simple and reliable. However, when manufacturers find their material rejected on account of excess of copper or tin, they often claim that injustice is done them. They assert that the right amount of copper and tin were put in and therefore the chemist must be mistaken, and propose to take drillings from some other part of the metal. This, of course, is never allowed, because it is quite possible to find some part of bad material good. The contract requires that all parts must be good and the material of uniform quality. Another claim made is that the material is better than that specified, because of an excess of more expensive materials, copper and tin. This claim is also rejected, because the question of price is not the only factor. The Government is not paying for the components separately, but for the completed product. The strength of the specified composition is known, but not the strength of every other conceivable mixture. Further, the manufacturer in such cases does not submit any data taken by disinterested experts, to show that the particular mixture in the case in question is as good as that specified for the purpose for which it is to be used. Also

*Portion of an article in the Journal of the American Society of Naval Engineers by Captain Walter F. Worthington, U. S. N. August, 1912.

the fact that the manufacturer attempted to produce a certain composition and ended by producing a different one shows lack of skill on his part, and throws doubt on the quality of his product, especially when the composition reproduced costs him more than that he contracted to furnish. The truth is that when a composition turns out to have a larger percentage of copper or tin, or both, than called for by the contract, it is not the least likely that the manufacturer put in more of these metals than required, but it is likely that the more volatile zinc has been driven off by melting at too great heat. It may also be true that from some inequality of the mixing there is too much copper or tin in one part and too little in another, and the drillings happen to have been taken from the former part. This would mean lack of uniform strength in the different parts, and is a just cause for rejection.

The Government specifications for brass allow a liberal tolerance, and are usually met at first trial by one manufacturer in this district, but give trouble to several others.

For instance, in the case of phosphor bronze, copper may vary from 85 to 95; manganese bronze 59 to 63, etc.

When an analysis is made and it is found that the material fails to meet the specifications a check analysis is made at once. In the case of rejection on account of the chemical analysis, and if the manufacturer claims that an error has been made, a sample is sent to the Bureau of Standards at Washington for a further check.

A New Case-Hardening Compound.

A new case-hardening compound has been patented by Patrick W. Brennan of Philadelphia, Pa. It consists of the following materials:

Potassium Cyanide	2 oz.
Sodium Bi-Carbonate	1 oz.
Potassium Bi-Carbonate	1 oz.
Bone-Dust	½ oz.

The ingredients are powdered and thoroughly mixed. The iron or steel to be case hardened is heated and covered with the mixture, after which it is again heated to a bright red and plunged into water. The depth of the case-hardening may be regulated by the number of times the iron or steel is heated with the mixture.

How to Mix Sulphuric Acid and Water.

One of the first things that is taught a young chemist is how to mix sulphuric acid and water. To the layman, this sounds more or less laughable as it would appear that the mixing is simply one of pouring together, just as milk and water or any two liquids of a dissimilar nature would be mixed. The matter is entirely different, however, when sulphuric acid and water are to be mixed and unless done right, personal injury to the operator may follow. In many instances, ignorance of the proper method of mixing them has resulted in the burning of the workman doing the mixing.

Sulphuric acid is a very heavy liquid. Strong commercial acid is 1.8 heavier than water. Suppose, therefore, that 5 gallons of water and 5 gallons of sulphuric acid are to be mixed. Sulphuric acid has a very strong affinity for water and much heat is generated when the two are mixed. Suppose we try to mix the water and acid in the wrong way and see what happens:

The acid is put into a 10 gallon stone-crock and the water is poured on it. The sulphuric acid, being so much heavier than the water, remains in the bottom of the crock and the water lies on top of it and does not mix. This seems simple and harmless, but, as previously mentioned, the acid and water have a very strong affinity for one another. This is soon manifested at the junction of the sulphuric acid and the water where the two can react with one another. Heat begins to be generated and this heat is increased until steam is formed. This starts the water boiling and stirs up the whole mass with the result that it is not infrequent that the whole solution—water and acid—will be violently ejected or thrown out of the stone crock; and if the operator is near it, he may receive it on his person. Being hot, a bad burn results.

The Right Way to Mix the Acid and Water

The right way to mix sulphuric acid and water is to pour the acid *into* the water, a little at a time and then stir. In this manner a complete mixture without danger is obtained.

If, for example, we desire to mix 5 gallons of sulphuric acid and 5 gallons of water, proceed as follows:

1. Place the 5 gallons of water in a 10 gallon stone crock.

2. Pour the 5 gallons of sulphuric acid

into it and stir with a wooden stick. Pour the acid a little at a time and stir continuously.

The mixture will always become hot, and this cannot be avoided. If desired to be used cold, then ample time must be given it for cooling.

In mixing sulphuric acid with other light liquids, the same rule applies. Pour the sulphuric acid *into* the others.

Soaking in Hot Water as a Remedy for "Spotting-Out."

Much has been written upon the subject of spotting out and it is now admitted by all platers that it may come from two causes:

1. Pores or cavities in the metal that has been plated.

2. Blisters on the surface of the plated metal.

The blisters usually occur on smooth surfaces and are very readily distinguished. They are easily overcome and the plater is at fault when he has them.

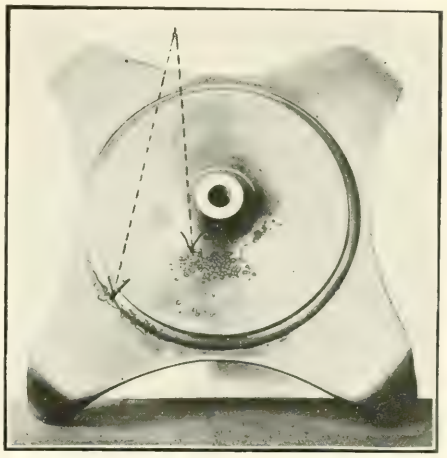
The ordinary cases of spotting-out, however, occur on castings and are caused by the plating solution penetrating the pores or cavities of the metal; and then, after the work has been finished, oozing out from these cavity imperfections and spotting the surface for some distance around the mouth of the cavity.

Suppose, for example, a porous, malleable-iron casting is to be copper plated in a cyanide copper solution. When finished and lacquered, small stains appear upon the surface and spoil the appearance of the article. The cyanide plating solution had penetrated the pores (or really imperfections in the form of cavities) and, not being removed in the rinsing had gradually worked out after the article had been completed and stained the surface.

The remedy for spotting-out seems simple. All that it would appear necessary to do is to remove the plating solution from the pores. This is not as easy as it looks. Heating will not remove it, nor will ordinary rinsing. One method, now extensively used, is to allow the work to remain for some time to give the solution all the opportunity it can for spotting-out, and then finish. In other words, to let the plating solution do all the mischief it will, and then remove the effect, by buffing, dipping or other forms of finishing. This takes time and in many instances cannot be tolerated. The following information has been gleaned in watching platers who have difficulty in spotting out.

In plating goods, it is customary to remove them from the plating solution, run through cold water to remove the plating solution from the surface, and then through hot water to heat the goods so that they will dry off. Both these rinsings are almost invariably rapid. When one stops to think, it will appreciated that such a rapid rinsing cannot remove anything except that on the surface; while the plating solution in the cavities is not touched.

Hot water is the best solvent for plating salts, such as those of a copper plating solution; but it must be given an opportunity to act. If a piece of work that gives trouble in



Brass Casting Which Had Been Copper Plated in a Cyanide Copper Solution and Had Spotted Out.

spotting out is allowed to soak in boiling water for some time, it will usually be found that the spotting out will disappear. It has been tried in a number of establishments with the best of results. Several points must be borne in mind, however, and they are as follows:

Points in Using the Hot Water Treatment

1. The water must be very clean and pure.

2. It must be changed from time to time. Dirty water will defeat the end.

3. The water should be very hot. Actually boiling is preferable.

4. The soaking should be very hot. Actually boiling is preferable.

5. The soaking should be prolonged. The severity of the case of spotting-out will determine this.

6. There should be plenty of water so that the salts dissolved from the pores will not contaminate it. Change the water as frequently as possible so as to keep clean.

In this manner the salts in the plating solution in the pores of the castings will be removed by dissolving and pure water will be left. This water, left as the final product, can be dried out without leaving any material to spot-out.

Silver Cyanide and its Properties.

Although closely resembling silver chloride in many of its properties, silver cyanide differs from it in others. As it is used in silver plating to a large extent, its properties, compared with those of silver chloride, may be of interest.

Silver cyanide, when freshly precipitated by potassium or sodium cyanide from a silver nitrate solution, is white and curdy and does collect in flocks as readily as silver chloride. Silver cyanide, however, has a flocculent nature, but does not collect in large flocks when agitated like silver chloride. Those who are experienced can usually distinguish between the cyanide and chloride by the difference in the character of the flocks. Ordinary observers, however, cannot usually detect any difference.

The white, curdy silver cyanide is insoluble in water and dilute nitric acid. In strong nitric acid, particularly when hot, it is soluble with liberation of hydrocyanic acid gas. In this respect it differs from silver chloride.

Silver cyanide may be dried at 100°C. (212°F) without decomposing or changing it in any way. Upon ignition at a low red heat or higher, cyanogen is given off and pure silver containing a little paracyanide of silver remains.

Silver cyanide is quite soluble in potassium cyanide and also in ammonia; and in these respects it resembles silver chloride. By boiling with equal parts of water and sulphuric acid, it is dissolved with the formation of silver sulphate and hydrocyanide acid gas is given off.

Silver cyanide is always preferable to silver chloride in making up a silver solution as it has been found that the iron hooks and anode rods are not as readily attacked on account of the freedom from any liberation of chlorine gas at the anode. There is no foreign salt like sodium or potassium chloride formed, like that which takes place in the use of silver chloride. In other words, silver cyanide is the logical silver salt to use in making up a silver solution. The reason why it is not universally used is the fact that it is much more difficult to make than the chloride on account of its solubility in potassium or sodium cyanides and, therefore, care must be used in the precipitation or the silver cyanide will redissolve.

When the method of making silver cyanide is understood, however, it is not difficult and but slightly more troublesome than the manufacture of silver chloride. One great difficulty encountered by many platers is the presence of an excess of acid in the silver nitrate used as the starting point. This liberates large quantities of hydrocyanic acid gas when the precipitation is commenced and renders the operation dangerous. *To make silver cyanide in the right manner, fused nitrate of silver should be used.*

The fused nitrate of silver contains no free acid and is dissolved in water and a solution of potassium or sodium cyanide added. The white, flocculent precipitate of silver cyanide is thrown down. The cyanide is added little by little and care used to ascertain that more silver cyanide is precipitated after each addition. When the cyanide fails to precipitate any more, stop as a further addition will dissolve the silver cyanide already formed.

Filter off the silver cyanide, wash well with hot water and do not allow to dry. Dissolve in the necessary quantity of cyanide for the solution at once if possible. If the silver cyanide is allowed to become dry, it dissolves with more difficulty.

Silver cyanide contains 80.56% of metallic silver. Silver chloride contains 75.27% of metallic silver.

For etching the name on steel knives, the so-called "rubber stamp method" is employed. This is the cheapest form of etching and gives the poorest results. The knife is coated with a varnish made by dissolving gum-guaiacum in alcohol. A rubber stamp is dipped on a piece of cotton or a pad saturated with a potash solution and then stamped on the varnish. The potash dissolves the varnish, leaving the steel bare. The etching is then done by means of dilute nitric acid.

A Peculiar Example of Nickel Plated Rubber.

While there may not be any need of nickel plating rubber, the rubber shown in the illustration herewith reproduced, may be of interest.

Rubber Hose Which Became Coated with a Nickel Deposit.

The rubber was a piece of hose used to connect an iron pipe entering a nickel plating tank. The deposition of the nickel on it commenced at one end and finally covered the whole surface until finally it succeeded in short-circuiting the current.

The nickel deposited on the rubber to a thickness of one eighth of an inch.

Soft metals, such as britannia-metal or antimonial-lead should not be cleaned in the same kettle as that used for removing the grease from brass goods. Tin and lead, contained in the soft metals, are dissolved by the potash or soda in the alkali, and the brass will then become coated. Separate kettles should be used.

Recovery of Silver from Photographers' Solutions.

Inasmuch as one of the largest single uses of silver is in photography, it is natural that a considerable amount should find its way into the silver refining and sweeps trade through photographers. It may be said, however, that very much less is obtained from this class of trade than should be produced for the reason that many photographers make no attempt to save their solutions and throw them away regularly. This is quite true of a very large proportion of those who work dry plates (as the very large majority, of course, now do) as they are not familiar with the method of saving the silver or disposing of it after saving it. With the old wet plate process, photographers were always accustomed to save their silver wastes, for the reason that it amounted to a very large quantity and was of a character that could readily be reclaimed. While the wet plate process is used to-day to only a limited extent and is almost confined to the photoengravers trade, practically every professional photographer now employs the well known dry plates which have, as everyone knows, been the cause of the present popularity and enormous growth of both professional and amateur photography. Had it not been for the advent of dry plates, the art of photography would never have been what it is to-day.

The methods herein given for recovering silver from photographers' solutions apply only to dry plate work, as the wet plate process is used so rarely that it is unnecessary to consider it as a factor in the matter of silver saving when carried out according to the method herewith described.

"Hypo" Solutions the Only Ones Worth Saving

The modern photographer, who uses dry plates, has quite a number of solutions, but the principal ones are the two following:

1. The Developer.
2. The Fixing Solution.

The other solutions are of little importance as they are seldom used and contain no silver. They are employed for reduction or intensification of the silver image on the plate and cannot be considered.

The developer is the solution used to bring up the image upon the exposed dry plate and contains no silver when fresh and unused. After using, it contains traces of silver but not of sufficient quantity to warrant saving.

The developer, therefore, is of no value and should not be saved.

After the developer has brought out the image on the dry plate, there still remains the bromide of silver that has not been acted upon by the light during the exposure of the plate through the lens in the camera. The portions of the plate that have been acted upon by the light are reduced by the developer and are converted into metallic silver which constitutes the image. The portions unacted upon by the light are not reduced by the developer and thus remain as bromide of silver.

When the developer has been used, the dry plate must be "fixed" and this consists of soaking it in a solution of hyposulphite of soda or "hypo" as it is usually called. This material has the property of dissolving the bromide of silver, but does not dissolve the black metallic silver formed as the image by the developer. In this manner, therefore, all the silver unacted upon by light and which is in the form of bromide of silver is dissolved from the plate by the hyposulphite of soda, leaving the black, reduced silver comprising the image, untouched. The plate, of course, is coated with gelatine for the purpose of holding the silver compound used on it in place; and through the various operations of developing and fixing, this gelatine remains on the surface of the glass. A glass negative, therefore, that has been developed and fixed, as well as washed and dried, contains the image in the form of finely divided silver imbedded in the gelatine.

The "fixing solution" or that used to dissolve the unacted bromide of silver from the plate, is the only one that contains sufficient silver to be worth saving. This fact should be impressed upon photographers, many of whom save all solutions, so that only the fixing bath will be retained. If this is done, the operations is somewhat simplified.

What the "Hypo" Solution Is

The so-called "hypo" solution, used for dissolving the bromide of silver on the dry plate that has been unacted upon by the light, consists of a nearly saturated solution of hyposulphite of soda (sodium thiosulphite) in water. It is frequently used alone, but more often contains alum. The alum is used in connection with it to harden the gelatine on the glass plate and prevent it frilling at the edges. The use of alum is now extensive and nearly all photographers employ it. In addition to the alum (either ordinary alum or chrome alum may be used) small quantities of acetic acid, sulphuric acid, sulphite of soda, oxalic acid or other weak acids are employed to render the solution slightly acid. The principal ingredient, however, is the hyposulphite of soda and it is this substance which dissolves the bromide of silver.

It is customary for photographers to use their "hypo" solutions until nearly "exhausted", so to speak, or until it works slowly. They are then discarded and a new one made up.

Recovering the Silver from the "Hypo" Solution

As the "hypo" solution is the only one used by photographers which contains sufficient silver to pay for treatment, it is upon this, therefore, that we must concentrate our attention. The removal of the silver is simple.

The first thing to do is to render the "hypo" solution slightly alkaline by the addition of a little carbonate of soda solution. Add just enough to make slightly alkaline. In other words, red litmus paper should turn blue when wet with it.

Now add a little of a solution of *liver of sulphur* in water to this "hypo" solution and allow it to stand in a warm place for a short time. The liver of sulphur will precipitate the silver in the hypo solution as sulphide. The silver does not usually precipitate immediately, but takes a few minutes to form, and if warmed the formation takes place more rapidly. Its formation can be seen by the presence of black flocks of sulphide of silver which settle down to the bottom of the vessel. When the top of the solution is clear, add some more of the liver of sulphur solution and see if a sufficient quantity has been added to precipitate all the silver. If not, add more. The idea is to avoid adding too large an excess of the liver of sulphur, although a moderate excess is not harmful.

When enough liver of sulphur has been added to precipitate or "throw-down" all of the silver in the "hypo" solution, the whole should be allowed to stand in a warm place for about an hour to give it an opportunity to settle. At the end of this time, the black sulphide of silver will be found on the bottom of the vessel. The clear solution at the top should be tested with liver of sulphur to make sure there is no silver left, and if this is the case, it may be siphoned off and thrown away.

The sulphide of silver on the bottom should be washed with water, by stirring up with clear water, and then allowed to settle. The clear liquid is again siphoned or poured off and the washing operation repeated. This may be carried on several times and finally the whole poured on to a filter paper in a large glass funnel and the silver sulphide filtered out. While on the filter it should be washed several times with clean water.

If everything has been done well, there is obtained a mass of fairly pure sulphide of silver in the moist state. This should be dried. Pure sulphide of silver contains 87.09% of metallic silver.

If one desires to reduce this to metallic silver, the best way is to dissolve it in dilute nitric acid, filter off the sulphur that separates and precipitate the metallic silver by means of copper sheet or wire. Such a procedure, however, is not advisable as the sulphide of silver is always salable and is readily purchased by silver smelters and refiners. They do not, however, as a usual rule, like to purchase the hypo solution for the reason that it usually does not contain sufficient silver to pay the transportation charges to any distance. By precipitating the silver in the manner described, therefore, the silver sulphide obtained, even when wet, is so rich that it will pay transporting to a long distance. The operation of precipitating it is so simple that photographers can do it at frequent intervals and gradually accumulate the sulphide of silver so that, when it has reached a sufficient amount, it can be sold to silver smelters. Or, if it is not desired to sell it, the silver can be reduced as previously mentioned. It will, it is believed, be found preferable to sell the sulphide of silver for the reason that there is no use for either metallic silver or nitrate of silver in the photographic studio when dry plates are employed.

Gold may be recovered from old gold plating solutions by the use of zinc shavings or zinc dust. The gold is precipitated when the zinc is allowed to remain in the solution for several hours with stirring. The gold and an excess of zinc remain. This, when treated with nitric acid, leaves the gold. One-half ounce of zinc to each gallon of gold solution is ample.

The "Eccentro" Balancing Washer for Grinding, Polishing and Buffing Wheels.

Engineering calculations, based upon experiments, show that a piece of lead, weighing one ounce, nailed 6 inches from the center of a wheel running at 2500 revolutions per minute, exerts a pull of 66 lbs. upon the nail; and should the nail give away, the lead would fly off at a tangent with the same force as if it were dropped from a height of 266 feet.

The "Eccentro" Balancing Washer.

These facts indicate the necessity of having grinding, polishing or buffing wheels run perfectly true and the various attempts that are made to accomplish this are frequently amusing to say nothing of being dangerous. A piece of lead is often nailed on the side of a wheel to balance it and other similar devices are also employed with more or less danger.

A new and novel device called the "Eccentro" Balancing Washer has recently made its appearance on the market and is so simple that it becomes interesting at once. This washer is herewith illustrated and consists of an eccentric metal washer that is placed on the spindle and moved as desired to balance the wheel. It cannot come off as it is on the spindle and by moving it one way or the other, the wheel may be balanced as desired.

This washer is quite cheap and is made by the King Manufacturing Co., of Chicago, Ill., who manufacture them for the trade and will gladly supply additional information.

A Cartridge Factory for Abyssinia.

The efforts made by the powers to prevent the importantion of arms and ammunition into Abyssina has constrained the Abyssinian Government to erect a cartridge factory in the capital, Adis Ababa. The cartridge-manufacturing plant has been purchased in Germany, and has a capacity to turn out 10,000,000 cartridges per annum. The building destined to receive it has already been completed, and the machinery has been dispatched from Germany and is about to arrive at Adis Ababa. The factory will have a workshop attached for the repair of military weapons, in which from 15,000 to 20,000 rifles can be repaired every year. The machanics required for this service have been engaged in England, and are also on their way out to take up their work in Adis Ababa. Power will be supplied to the cartridge factory, as well as other factories in the capital, by hydroelectric plant supplied by a Manchester firm. This plant is already erected at the power station on the river Akaki, 18 miles from the capital. It consists of two 200-horsepower dynamos, which will transmit current 6,000 volts to Adis Ababa, where it will be used not only for power but also for house and street lighting. —*Daily Consular Report.*

Fusel-Oil in Argentina.

The principal Province of Argentina in the production of alcohol is Tucuman, where it is distilled from cane sugar. The redistilled product is sold to perfumers and the residue to manufacturers of cognac and rum. In the city of Buenos Aires alcohol is made out of corn, but last year, due to the short crop, there was very little done in this line.

A chemical concern in this city states that it has twice imported fusel oil from Europe this year, finding it more advantageous than to accept the local product gratis and rectify it, as the latter is unfit for technical purposes. It is mostly disposed of to varnish makers, to be used as a solvent. *Daily Consular Report.*

Melting Points of Various Salts.

The extensive use of metallic salts for hardening steel, as fluxes and other work in which melting or heating is carried out, creates an interest in the actual melting points of such materials. The following melting points have been taken from *Carnelly's Table of Melting Points,* and they will, it is believed, prove of interest to those who are interested in this line of work:

Substance	*Melting Point in Degrees C.*
Barium Fluoride	1000°
Calcium Fluoride (Fluor-Spar)	1000°
Potassium Fluoride	790°
Lithium Fluoride	801°
Magnesium Fluoride	908°
Sodium Fluoride	902°
Strontium Fluoride	734°
Silver Chloride	451°
Aluminum Chloride	180°
Barium Chloride	860°
Calcium Chloride	720°
Cuprous Chloride	434°
Cupric Chloride	498°
Ferric Chloride (Iron Perchloride)	300°
Potassium Chloride	730°
Lithium Chloride	600°
Magnesium Chloride	708°
Sodium Chloride (Common Salt)*	770°
Lead Chloride	500°
Strontium Chloride	825°
Zinc Chloride	262°
Boron Trioxide (Boric Acid)	570°
Aluminum Oxide	*
Magnesium Oxide	*
Sodium Nitrate	300°
Potassium Nitrate	340°
Potassium Carbonate	830°
Sodium Carbonate	814°
Lithium Carbonate	695°
Sodium Silicate (Water Glass)	45°

In connection with the melting points of substances, it should be understood that a mixture of two salts frequently melts at a lower temperature than either. For example, a mixture of potassium carbonate and sodium carbonate melts at a lower temperature than either of the salts.

*Infusible except at the highest known temperatures.

Standard Brass Foundry Mixtures and Method of Making Them.

By Erwin S. Sperry.

(Continued from page 286, Aug., 1912)

Brazing Brass.

The term "brazing brass" is used to designate a variety of yellow brass that will stand brazing with ordinary yellow brazing solder (spelter solder) without melting or cracking. Ordinary yellow brass will not answer the purpose as its melting point is too close to that of the brazing solder.

Fig. 1. Brass Flange for Brazing to Copper Pipe. A Common Use of Brazing Metal.

Ordinary brazing solder (spelter solder) is composed of equal parts of copper and zinc and it has a golden yellow color. For use, it is generally granulated by pounding it in a mortar.

It will readily be appreciated that to braze any metal with this brazing solder, the melting point of the metal must be sufficiently high to avoid melting or cracking during the brazing operation. Copper, of course, answers, but this is too soft for use where a brazing metal is to be used. The bronzes, containing tin, will not stand the heat and soon crack. The mixture that has been found satisfactory and which will stand the necessary heat is the following:

Mixture for Brazing Brass

Copper	80 lbs.	or 800 grams
Zinc	20 lbs.	or 200 grams
Total	100 lbs.	or 1000 grams

No tin or lead should be used in the brass and the most common use for it is in connection with copper pipe, to which it is fastened.

The Government uses a little less zinc in their standard brazing mixture and their standard formula is 85 lbs. of copper and 15 lbs. of zinc. The color is not yellow but more of an orange and if a yellow brass is desired, the one first given must be employed. It is the one with the least possible amount of zinc in it and still have the yellow color. If, however, the color is of no importance, the Government mixture can be used as it has a little higher melting point than the other mixture.

Hose Couplings.

While a good gun-metal (88-10-2) mixture is the best for hose couplings on account of its strength, yellow brass has to answer in many instances on account of the price. The great objection to yellow brass is its liability to bend by being dropped or hit.

For the cheapest class of hose-couplings, the cheapest of yellow brass scrap is used and no attempt is made to have any particular mixture. Cheapness is all that is required.

For a better grade of yellow brass hose couplings, the following mixture is suitable:

Fig. 2. Hose Coupling. Illustrating Application of the Mixture.

Mixture for Hose Couplings

Copper	65 lbs.	or 650 grams
Zinc	30 lbs.	or 300 grams
Lead	3 lbs.	or 30 grams
Tin	2 lbs.	or 20 grams
Total	100 lbs.	or 1000 grams

For a cheap class of yellow brass couplings, the tin may be omitted from the preceding mixture, but the castings will not be as stiff and will be more apt to become bent while in use. This bending is objectionable for the

reason that the threads will not enter one another and the couplings then cannot be put together.

For nozzles and similar yellow brass material, where the best yellow brass is desired, the foregoing mixture can also be used. For the cheapest class of work, however, it will be impossible to use new materials, and particularly the tin, so that the only alternative is to purchase scrap.

Correspondence.

"Prometheus" Nickel Salts.

Editor:

As you are no doubt aware, a new nickel plating salt has recently made its appearance on the market and is imported from Germany. Having had a sample submitted to me for trial, I found that it gives an excellent nickel deposit and with a less amount of time consumed. It seems to work more readily than ordinary nickel plating salts and a heavier deposit can be obtained in a given time. The color seems to be about the same as any good nickel.

Double Nickel Salts	89.34%
Boracic Acid	7.15%
Sal-Ammoniac	3.51%

It would appear, therefore, that there is "nothing new under the sun". The salts contain boracic acid and sal-ammoniac which have been used for a long time in the United States with excellent results. The use of boracic acid was patented many years ago by Edward Weston the well known maker of electrical instruments, and the amount shown by the analysis is about what he recommended in his patents.

The "Prometheus" nickel salts, however, seem to give excellent results and are now being used to a considerable extent.

X. Y. Z.

Nickel solutions that are alkaline give brittle deposits and if the alkali is excessive the deposit will frequently peel in the solution.

Dr Isaac Adams, the inventor of nickel plating, patented the use of tin in a nickel anode and it is still used for producing a sound casting and causing the anode to dissolve well in the plating solution.

Metal Coloring by Using as an Anode in Ammonical Baths.

Some interesting results of experiments were recently published by V. Paissakowitsch in *Elektrochem. Zeitschrift,* 18, 1912 and 19, 1912. The separation of the oxides of iron, manganese and nickel on the anode from ammoniacal solutions of their salts was the subject of the investigation. The object was to produce colored films on the surface of a metallic article used as an anode in the salt dissolved in ammonia and used as the electrolyte.

For a good adherence of the film, it was found necessary that the surface of the metal used as the anode should be free from grease, polished and free from foreign matter. The removal of the grease is best effected in an electric cleaner containing an alkali carbonate or a cyanide. This removes not only saponifiable but also unsaponifiable matter, particularly if the article is used alternately as an anode and a cathode.

The investigations were carried out with iron or steel anodes in all cases. Ferric oxide and manganese dioxide can easily be deposited as adherent layers of varying color, and under suitable conditions the process may be of commercial value. This is particularly the case with the deposit of manganese dioxide which is produced with a voltage of from 1.75 to 2.5. The deposit is very adherent and appears to form an admirable protection against corrosive influences.

From ammoniacal nickel solutions the deposits produced are not as satisfactory. The conditions under which the precipitation takes place are very limited and difficult to control. The color is unattractive and the deposit adheres badly. The potential required for the deposition of the oxides varies considerably with the metal. In the case of iron, a deposit which consists of partly ferrous iron is apparently obtained with very small potentials. As the potential rises, the amount of ferric iron in the deposit increases. In the case of manganese, no oxide at all is deposited below 0.4 volt, and in the case of nickel, the formation of the peroxide seems to be closely connected with the production of molecular oxygen; and consequently it only appears at potentials which allow the evolution of gaseous oxygen.

The Alloys of Platinum and Aluminum.

Chouriguine, in *Comptes Rendus* describes his experiments on the alloying of platinum and aluminum. The alloys were made by adding platinum wire to molten aluminum in an electric furnace. The oxidation of the aluminum was prevented by covering with lithium chloride. This was best accomplished, the author states, by soaking the pieces of aluminum in a solution of lithium chloride and allowing them to dry before melting. This results in preventing the oxidation of the aluminum during melting, and also protects it after melting.

When containing less than 10% of platinum, the aluminum and platinum alloys were white, soft and very malleable. If the platinum content is increased from 10% to 70%, the alloy becomes hard and brittle and still white. If above 70% platinum content, the alloys are yellow and brittle. The yellow color disappears at 90% platinum and the alloy becomes white again, yet still brittle.

There is apparently no commercial use for any of these alloys as their brittle nature is such that they could not be used in the manufacture of jewelry.

Another Aluminum Solder.

Another aluminum-solder has been added to the already long list now in existence. This time it has been patented by Charles R. Erkens of the Simplex Aluminum Solder Co. Inc., of New York City. The solder is composed of the following:

Tin	60 lbs.
Zinc	15 lbs.
Lead	10 lbs.
Antimony	5 lbs.
Bismuth	5 lbs.
Chromium	5 lbs.

The metals are melted, according to the inventor, and then treated with "35 grams of salicylic acid and 10 grams of calcium to each 5 lbs. of the alloy; and for a like amount of material 2 grams of sulphur." The inventor states that the sulphur acts as a "binding agent." The solder is used with the ordinary solder fluxes for soft solder and in the same manner.

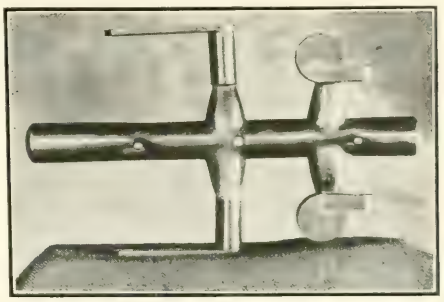
Correspondence.

Use of Large Gates in Casting the Strong Bronzes.

Editor:

So many founders seem to have difficulty in casting manganese-bronze and other strong bronze containing aluminum, that I thought a suggestion to them might be of value.

A casting in cooling must draw metal from some where. If it does not draw it from the gate, it will draw from "itself". By this is meant that there will be a cavity in the middle of the thickest portion.



Method of Gating for Manganese-Bronze.

The whole problem in the case of bench work is to give the casting as large a gate as possible. When this is done, the casting, being smaller than the gate, will cool first and draw what metal they need from it. In this manner the castings will be sound and the cavity, produced by shrinkage, will be found in the gate where no harm occurs.

In the illustration shown, my idea of gating is illustrated. The gate is made sufficiently large to feed the casting when it cools. There is one objection put forth by founders to this manner of gating and that is the work which follows the cutting-off of the castings. There is also more scrap in the form of gates to be melted. These objections, however, are not real for the reason that poor castings, many of theme worthless, result if the gating is not properly done.

BENCH MOLDER.

Lacquer may be stripped from lacquered goods by means of caustic potash or caustic soda and also by means of the thinner used in thinning the lacquer. This acts as a solvent. The caustic potash or caustic soda leaves a stained surface, however, which must be refinished. The thinner does not.

Electrolytic Removal of Tarnish from Silverware.

Editor:

Noting the article in THE BRASS WORLD, August, 1912, on the English process and apparatus for cleaning silverware by electrolytic action and the origin of the method, the enclosed letter may be of interest. I do not know of the method having been suggested previously. Perhaps you do.

Respectfully yours,

Aug. 17, 1912. *Charles E. Swett.*

This letter is in reply to a manufacturer who desired to remove stains from silverware.

The tarnish on silverware is silver sulphide. For silver sulphide there is no solvent which is not also a better solvent for the silver itself. This being the case, it is idle to try to remove the tarnish with a solution. It may, however, be done electrically.

Hang the work to be cleaned from the cathode pole in a dilute solution of sulphuric or hydrochloric acid. One part of acid to 10 of water will be about right. Use a carbon anode. The sulphur will be removed in a few minutes. None of the silver is stripped from the article.

If no battery is had, the same result can be accomplished by suspending the silverware to be cleaned in a similar solution and bringing it in contact with a piece of aluminum. This will restore the lustre.

For the best results use pure acids, not the commercial ones as these contain lead.

C. E. S.

Assaying Standards of Russian Silver and Gold Wares.

An inquiry has been received at this consulate general requesting information concerning the importation of articles composed of gold and silver. Volume II of the Code of Laws of Russian Empire contains the following statute regarding the assaying standards of precious metals:

Gold and silver articles are considered such in which precious metals (gold and silver) form with others, not precious metals, an alloy. All gold and silver articles intended for trade, whether made in the country or imported from abroad, must bear a hall-mark which is impressed by one of the assaying institutions of Russia.

The following are exceptions to this law: (1) Mathematical and surgical instruments and the settings for false teeth. (2) Gold and silver articles that weigh less than half a zolotnik (2.1328 grams). (3) Gold and silver sheets which can be considered as raw material. (4) Manufacturers of gold and silver wire and thread.

Official Hall-Marks—Fees.

The proportion of pure gold and silver contained in a gold or silver article meant for trade is expressed by a stamp or mark which fixes the number of zolotniks of pure metal in a pound of alloy. (A Russian pound is equal to 96 zolotniks.) For articles of gold there are the marks 56, 72, 82, 92, and 94; for articles of silver, 84, 88, 91, and 95; for articles of chased gold, from 87 to 96; for articles of "green" gold, 72.

In the event that a given article does not exactly correspond in regard to the amount of gold or silver that it contains with any of the above figures, it is stamped with the next lower number.

All the parts of gold and silver articles must not contain less of the precious metal than is expressed by the lowest mark. The only exceptions are when, for the sake of strength or durability, it is necessary to add some other metal to such parts. In all other cases it is indispensable that the parts made of nonprecious metal should be made in such manner that the purchaser should not be led into error. Otherwise it is required that such parts made of non precious metal have a special mark stamped upon them.

Gold and silver articles coming in from abroad shall be delivered to the custom-house officials, who must send them to the nearest assaying chamber, where they are marked according to their standard, and thence returned to the customhouse authorities. The fee charged for stamping the mark is 30 cents per zolotnik of gold and 1½ cents per zolotnik of silver.—*Daily Consular Report.*

If nickel is deposited with a slow current and with plenty of boracic acid in the solution, it is sufficently soft to stand burnishing. Nickel plated glove fasteners and similar articles are now being burnished instead of buffed as it has been found cheaper to do them in this manner. A blood-stone burnisher must be used as the dust which is formed, adheres to a steel burnisher.

A Cheap, Genuine Manganese Bronze.

Editor:

In THE BRASS WORLD, August, 1912, I find an article on "Imitation Manganese-Bronze", in which the following mixture is recommended:

Copper	55 lbs.
Zinc	44 lbs.
Tin	½ lb.
Aluminum	½ lb.

as a substitute for manganese-bronze.

This mixture which you recommend as an imitation is first-class; however, by substituting 5 lbs. of the copper with 5 lbs. of "Royal Manganese-Copper" containing 30% manganese, the mixture can be made into a real manganese-bronze, increasing the cost by only 35 cents per 100 lbs.

The total cost of a manganese-bronze, containing 50 lbs. of copper, 44 lbs. of zinc, 5 lbs. of "Royal" manganese-bronze, ½ lb. tin, and ½ lb. of aluminum is 13 1/8 cents, figuring all the items as the best possible material that can be obtained.

Every brass foundry can make this bronze by preceding directions. If ingot manganese-bronze is purchased, from 4 to 5 cents per lb. more will have to be paid. Manganese-bronze made as previously mentioned is suitable for most purposes, and has a tensile strength of upwards of 50,000 lbs. per sq. in.

31 *Broadway,* *R. F. LANG.*
New York City.
Aug. 17, 1912.

New Books.

Hendrick's Commercial Register for 1912.

Twenty-First Edition.

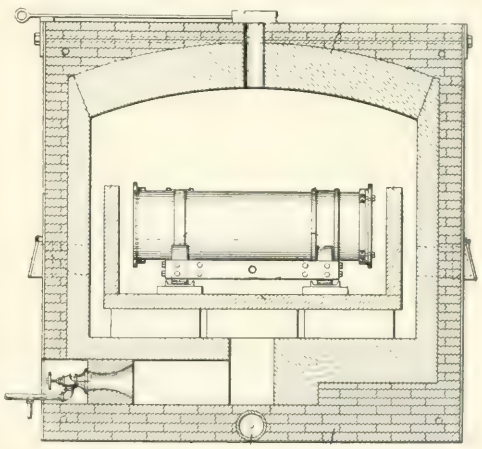
The twenty-first annual Revised Edition of Hendericks' Commercial Register of the United States for Buyers and Sellers has just been issued. Established in 1891, it has been published annually since that time and is the most complete work of its kind in existence. Its aim is to furnish complete classified lists of Manufacturers for the benefit of those who want to buy as well as for those who have something to sell. It covers very completely the Architectural, Engineering, Electrical, Mechanical, Railroad, Mining, Manufacturing and kindred trades and professions.

The total number of classifications in the book is over 50,000, each representing the manufacturers or dealers of some machine, tool, specialty or material required in the architectural, engineering, mechanical, electrical, railroad, mine and kindred industries. The twentieth Edition numbered 1,419 pages, while the twenty-first Edition numbers 1,574 or 155 additional pages. Add to the latter about 230 pages of cancellations, errors, etc., omitted from the present edition, and you have a total of 385 pages of new matter, the whole representing upwards of 385,000 names and addresses. An important feature of the Commercial Register is the simplicity of its classifications. They are so arranged that the book can be used for either purchasing or mailing purposes.

The publishers of this book are S. E. Hendricks Co., 74 Lafayette St., New York City and the price is $10.00 expressage prepaid to any part of the United States.

A Modification in Sherardizing Furnaces.

In sherardizing articles by means of zinc dust. it is necessary to heat them in an iron drum to a temperature slightly below the melting point of zinc while imbedded in the dust. This operation takes several hours or more and during this time, the drum in which the iron or steel goods to be sherardized are placed must be turned over or revolved from time to time so as to expose fresh surface of the zinc.



Sherardizing Furnace of Improved Design.

A modification has been devised at the

works of the General Electric Co., of Schenectady, N. Y. in which a number of drums are placed in a special furnace as herewith illustrated. The drums are placed on rollers fixed to a frame and to this frame a cable is fastened. The cable is operated by a windlass outside of the furnace, and at both ends. By pulling on one end, the drums are moved and caused to revolve. A pull at the other end, likewise revolves them but in the opposite direction. A slight movement only is necessary and the cable method seems to give good results. At the end of the heating, the drums are removed from the furnace by a longer pull on the cable.

The furnace and moving appliances were the invention of John Riddell of the General Electric Co., and to whom a patent has been granted. The real novelty lies in the form of windlass used for revolving or moving the drums.

Vanadium in Chile, Argentina and Peru.

One of the Chile silver mines contains a valuable deposit known as chileite, a brownish mineral containing 7.5 per cent of vanadium, the use and importance of which is becoming greater every day. At Talcuna, in the Province of Coquimbo, in Chile, vanadium occurs in the form of a yellow earth between veins of copper ore, and to the northwest of Cordova in the department of Cruz del Eje it is met with in veins containing more than 5.5 per cent of the metal.

Vanadium frequently occurs in rocks containing carbonaceous material. The most important deposit of this character is found in Peru, at Minasragra, Cerro de Pasco, where a carbonaceous deposit occurs interstratified with sandstone; the lower portion contains 2 to 3 per cent of vanadium. In Argentina at San Rafael, in the Province of Mendoza, a lignite is found which yields on combustion 0.63 per cent of ash that contains over 21 per cent of vanadium; a similar lignite is found at Yauli, in Peru.

There is a large and increasing demand for the metal vanadium and its ores on account of the valuable properties of steel with which a minute amount of vanadium has been combined, in addition to the numerous other purposes to which vanadium and its compounds may be applied. It is found in many parts of the world, including England and Scotland, in a great variety of combinations; and, from its mode of occurrence and the nature of the rock formations in South America, it may in time be found in many other places on that continent. The most common forms of the ores are reddish or brownish in color, and when they contain a considerable amount of copper they may be more or less greenish. One deposit found in the State of Cordova is a lead vanadate, known as brackebuschite, combined with lead, vanadium, oxygen, and water; the lead is occasionally replaced by iron, zinc, or manganese. The mineral contains 14 per cent of vanadium and is black in color, but with a yellow streak.

When vanadium is to be utilized in the manufacture of vanadium steel, an alloy of iron and vanadium, containing 25 to 52 per cent of the latter, is the form in which it is offered to the market. For other purposes it is sold in the form of ammonium vanadate. The alloy of steel with only 0.25 per cent of vanadium yields a material very largely used in motor vehicles, as it has a high tensile strength and range of elasticity.

There are many other alloys which may be useful in the arts and manufactures, but at present the supply is insufficient and the price of vanadium is consequently high. South America is the most promising region from which larger supplies may be forth-coming, and where additional deposits may be discovered. The oxides are used to a limited extent for coloring pottery and glass. The pentoxide forms a useful substitute for gold bronze, as an ornamental surface covering; it has also been employed as a photographic developer and to increase the rapidity of oxidation of explosives. It has another use in the production of dyes, especially black dye, by its action in oxidizing aniline compounds; a very small quantity is sufficient, as it acts as a carrier of atmospheric oxygen.

It is probable that vanadium ores may be frequently overlooked by prospectors; there is, as indicated above, a ready market for an increased supply, and the deposits already found in South America may lead up to others.—*Daily Consular Report.*

The object of adding iron to nickel anodes is not to cheapen them but to cause them to dissolve readily in the solution, or, in other words, to become "soft."

New Form of Apparatus for Cleaning Metal Articles.

A new form of apparatus for cleaning silver and other metal ware has been patented by James D. Phillips and Carl Hambuechen of the University of Wisconsin, Madison, Wis. The apparatus may be described as follows:

The container wherein the articles are held during the cleaning operation is of special construction. It consists of a rectangular box

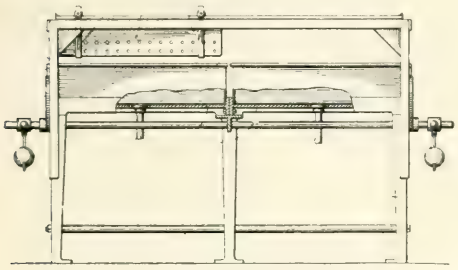


Fig. 1. View of Apparatus and Tray.

preferably made of zinc, though if desired it may be made of aluminum or other metal strongly electropositive. The bottom of the receptacle is flat and the bottom and the sides are perforated. Within the container and raised or projecting above the flat bottom is a grid or framework adapted to serve as the auxiliary metal in establishing effective electrical connection between the container and the articles to be cleaned during the time when the articles are exposed to the action of electrolyte. This grid preferably consists of a plurality of straight wires which carry another set of wires crosswise thereon and electrically welded thereto.

The entire structure has good electrical conductivity in every direction and may be regarded as integral throughout. The grid is heavily tinned so that it will present to the electrolyte a surface which is electro-negative to the zinc or other metal of which the container is made. Other metals than tin may be used for this surface, but preferably it should be a metal like tin which is intermediate in solution tension between the cleaning metal and the metal to be cleaned. The entire grid is permanently soldered to the bottom of the container as at the corners.

The method whereby this apparatus is used is as follows: An alkaline solution is placed in a receptacle to serve as the electrolyte or cleaning fluid. A suitable solution may be made by dissolving one tablespoonful of baking soda (sodium bicarbonate) and one-half tablespoonful of common salt in every quart of water used. To secure quick dissolving of the salt in the water, the container may be raised and lowered to serve as a mixer. Simultaneously heat may be applied at the steam jet. During this mixing operation the tinned wire grid is effectively cleaned through the galvanic action set up by the short circuited couple of which the zinc is anode and the grid is cathode. As soon as the grid is cleaned it becomes enveloped in a layer of hydrogen which so polarizes the couple as to prevent the further flow of current. The container is lifted from the electrolyte and filled with articles to be cleaned, such as table silver or the like. These articles rest directly on the cleaned grid and are therefore in good electrical connection with the

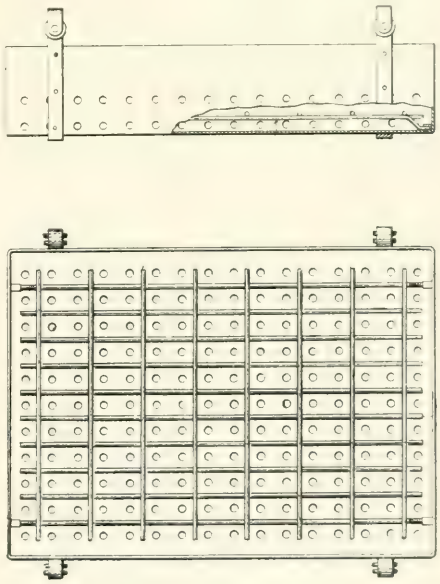


Fig. 2. Method of Constructing the Tray.

zinc container. The container is then lowered into the heated alkaline electrolyte and allowed to remain there until the electrolytic action has completely cleaned the tarnished surfaces.

"Soft" nickel anodes are those which dissolve readily in a plating solution. An anode may be "hard" as far as the actual metal is concerned and still be "soft" in dissolving.

A Process for Welding Aluminum to Other Metals.

A process for welding aluminum to other metals has been patented by Franz Jordan of Reinickendorf, Germany. The process is as follows:

The present method is based on the fact, that aluminum when heated to almost a welding heat will under access of air, show no oxidization which would prevent the welding, therefore remains weldable under pressure in this condition with other not so highly heated metals which will therefore not oxidize under access of the air, even if the melting point of these metals should be higher than that of aluminum.

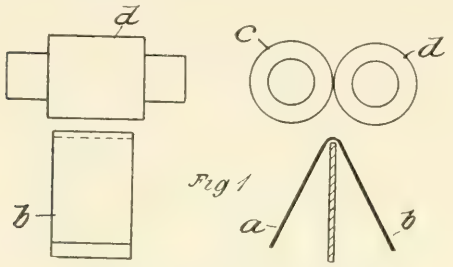


Fig. 1. Method of Welding Plates.

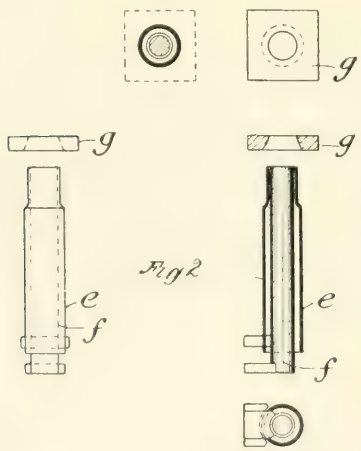


Fig. 2. Method of Welding Tubes, Rods or Bars.

Aluminum is heated in a furnace to its welding heat or the maximum temperature admitting of its still being worked under pressure. In a second furnace the metal of a higher melting point, to be welded to the aluminum, is heated so far only, that it will certainly not oxidize under access of air. In this condition the metals are united: 1. If in form of plates *a*, *b*, Fig. 1 they are placed, as shown in Fig. 1 in such a manner between the rollers *c*, *d*, that the plating metal *b* encompasses the metal to be plated *a* in form of an angle, so that the metallic surfaces to be united will for the purpose of avoiding a detrimental oxidization come in contact with each other only at the moment of the welding operation performed under pressure. 2. If in form of wires, bars, tubes, *e*, *f*, as shown in Fig. 2 they are placed in such a manner between the rollers or into the drawing dies *g*, that the plating metal will surround the wires, bars, tubes or the like in form of sleeve of a comparatively large diameter, without coming in contact therewith and is so welded thereto at one single operation. The method may be employed in the same manner for welding aluminum to metal alloys, the melting point of which is higher than that of aluminum, as also for welding aluminum alloys, which show the same properties as aluminum, with other metals or alloys of a higher melting point.

A New Rust-Proof Coating for Iron or Steel Goods.

A new rust-proof coating for iron or steel has recently been patented by George F. Wescott of the International Acheson Graphite Co., of Niagara Falls, N. Y. This coating is in the form of a paint that is applied to the surface of the article to be treated, and is then baked.

The following are the proportions of the ingredients by weight:

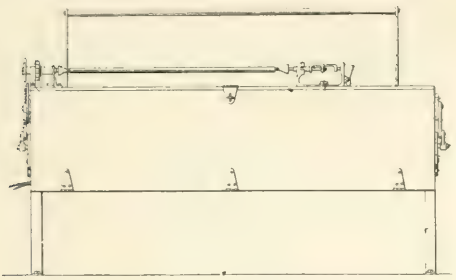
Linseed Oil	25	parts
Calcium Resinate	36	parts
Manganese Borate	½	part
Sugar of Lead	1	part
Naphtha	37½	parts
Artificial Graphite	25	parts

The whole is mixed and applied to the steel or iron by brushing, dipping, or other procedure. The article is then baked at 300° F. for a period of one hour and forty minutes.

It is stated that the coating is highly lustrous and is resistant to corrosive influences. An interesting feature of the coating, is, the inventor states, the fact that no other graphite except the artificial variety can be used with satisfactory results.

Heating Brass Bedstead Tubing for Lacquering.

In the manufacture of brass bedsteads, it is necessary to heat the tubes before applying the lacquer in order to cause it to dry before another coat is put on. Were this not done, each coat would remove the succeeding one; instead of a number of coats only one coating would be obtained.



Method of Heating Brass Bedstead Tubing by Electric Current for Lacquering.

This heating can be performed by any desired method. It is essential, however, that the heat be regulated within certain limits in order to obtain the best results. The heating of the tube is carried out by passing a current of electricity through it. The ends of the tube are clamped on a revolving carrier so that when heated and lacquered it may be swung around to the oven and heated, while at the same time another tube may be placed on the supports and operated upon.

Pyrophoric Alloys.

The pyrophoric properties of the alloys of cerium are due to the low kindling point of this metal. The fact that the alloys exhibit greater pyrophoric properties than the metal itself is accounted for as follows:

When friction is applied to the alloys the particles rubbed off are much smaller and the cerium more finely divided than would be possible if friction were applied to the pure metal, as the alloys are very much harder. In fact pure cerium is quite soft.

Fattinger, director of the Treibacher Chemical Works, has advanced the theory that this property is due to the presence of a coating of lower oxides without which the pure metal would not be pyrophoric. This theory was however, refuted by numerous experiments.

For industrial applications the pyrophoric alloys must satisfy the following requirements:

1. They must have a certain durability.
2. They should emit sparks very readily, that is, with but slight abrasion of the surface.
3. They must be readily sawed and milled.
4. They must offer a certain resistance in respect to the action of the air upon them.

These properties are somewhat contradictory and the alloys must be developed in one direction or another according to the use for which they are intended.

The most important alloys of cerium in view of their industrial uses are those with the heavy metals, especially with iron. The maximum pyrophoric energy is obtained with 30% of iron.

The manufacture of these alloys was reported for the first time in a German patent 154,807 of July 31st. 1903, taken out by Auer. After this patent which was subsequently attacked and some of its claims declared void, the alloy was produced by throwing finely divided iron into cerium melted in an electric furnace in which it was prepared by the decomposition of its chloride. Nevertheless it is rarely prepared in this manner.

In a gas or coke furnace a large graphite crucible is placed into which common salt or a mixture of sodium and potassium chlorides is introduced. When this is melted, iron is introduced in the form of fine wire or powder; when the contents of the crucible have regained their former temperature, the cerium is added in small pieces. When it melts it is stirred to aid in the dissolving of the iron. After heating one or two hours at bright redness, it is cooled in an ingot mold and the coating of alkaline salts removed as well as the impure outer surface.

The loss in the process is considerable. One Kilogram (2.2 lbs.) of cerium does not yield on an average the same weight of the alloys of cerium and iron. The cerium attacks the walls of the crucible. It forms carbide, oxide and silicate of cerium. If powdered iron is used which contains more oxygen than the wire, but dissolves better, the oxidation of the cerium is considerable.

In the sawing of the alloy and its further preparation for use the loss is again very great and may reach 25 to 40%.

Since the 1st of June 1911, the Société des Metaux Pyrophoriques of Cologne delivers this alloy at the rate of from $50 to $60 per kilogram. A kilogram is equivalent to 5000 "stones", 2x3x5 Milimeters.

There are other alloys of cerium with the heavy metal which have not, however, been put to any practicial use. The production of many of these alloys is attended with the liberation of so much heat as to amount to actual explosion, which renders the economic production of them impossible. Such are the alloys of cerium with arsenic, antimony and bismuth and to a less degree with lead.

Tin also alloys with great violence and gives a very pyrophoric alloy, so also does platinum. The alloy of 25% of the latter metal is hard and more pyrophoric than all others employed industrially. The alloys of cerium and copper are not perceptibly pyrophoric.

In the list of pyrophoric alloys of cerium with the lighter metals, the most important is the "Kunheim" described in the German patent 238,128 and based on the pyrophoric properties of the hydrides of the alkaline-earth metals. An alloy of cerium and magnesium containing for example 15% of magnesium is heated in an electric furnace to 550° C., and hydrogen is passed into it as long as it is absorbed. After cooling the alloy is ready to be used. The following is an analysis of the "Kunheim" alloy:

Cerium	30.00%
Other Metals of Group	49.00%
Magnesium	10.00%
Aluminum	1.00%
Iron	.50%
Silicon	.50%
Hydrogen	1.30%

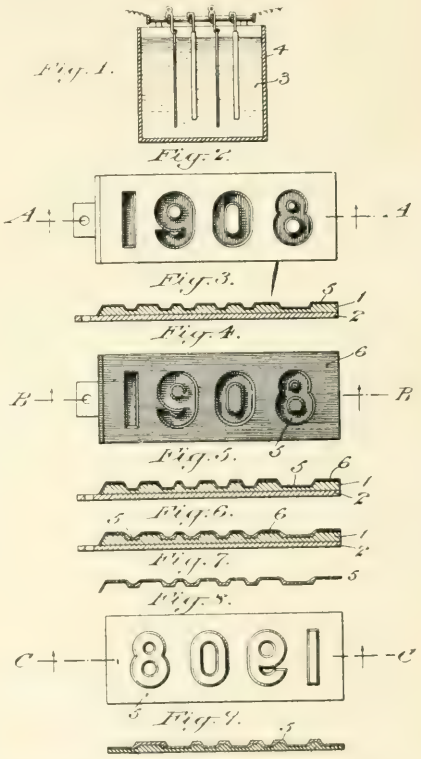
Traces of Berylium, Zirconium and Titanium.

The alloys of this sort are much lighter than the Auer alloys (cerium and iron) and are sold at the same price by weight; thus making it possible to produce twice as many pieces by pyrophoric apparatus at the same cost. These alloys give very hot and very dense sparks in the form of flame, and are particularly suitable for certain uses such as the lighting of miner's safety lamps.—*Le Mois Scientifique.*

Brass of a green shade contains from 75 to 80 per-cent. of copper and is known as "low brass."

An Improvement in Electrotyping.

An improvement in the art of electrotyping has been patented by Milton A. McKee of the C. B. Cottrell & Sons Company, Westerly, R. I., the well known manufacturers of printing and electrotyping machinery. Strictly speaking, the improvement consists in making the printing portions of an electrotype thicker than the parts which do not print. In this manner the printing parts are strengthened and rendered longer lived, and at the same time copper is saved.



Illustrating the Improved Method of Electrotyping.

In carrying out the improved process of forming electrotype plates, the mold 1 on the board 2 is first immersed in the liquid 3, contained by the bath tank 4, a sufficient time to permit the deposit of copper coating of a desired thickness thereon. The mold is then removed from its bath and those portions of the shell 5 upon which it is desired to prevent a further deposit of copper are coated with a deposit resisting material 6, such, for instance, as lithographers' ink. The mold,

with its partially completed shell 5, is then again immersed in the liquid bath 3 and a further deposit of the copper is permitted on the uncoated portions of the shell which, in the present instance, would be upon the backs or under the raised or printed portions of the plate. After a requisite amount of copper has been deposited on these uncoated portions of the shell, the mold is again removed from its liquid bath and the shell removed in the usual manner from the mold. The back of the shell may then be provided with the usual metal backing or filling 7.

In a plate formed according to this present invention, the low portions of the plate which make no printing impression may be made very thin and thus effect a large saving of copper while the portions which are to make the printing impression may be made much thicker and stronger, thus providing a firmer body for the impression strain.

Development of the Caustic Potash Industry in the United States.

During the period prior to 1909, the only American manufacturer of caustic potash was the Roberts Chemical company whose yearly output never exceeded 400,000 lbs. and practically none of this material of domestic manufacture was used in the soap trade.

Naturally the idea became thoroughly fixed in the minds of the soap manufacturers of this country that it was impossible for them to use any caustic potash, except that of foreign manufacture.

The Niagara Alkali Co., has established by its own operations that just as good caustic potash can be produced in the United States as in any country in the world. As was to be expected, the most progressive up-to-date and patriotic American manufacturers are rapidly changing over to an article of domestic manufacture in preference to continuing as buyers of imported material, so that during the past twelve months the Niagara Alkali Co.'s new plant in Niagara Falls has been operated at a production of six million pounds per annum. This increase of 1500% is quite gratifying to any American interested in the development of American industries.

During the period prior to 1909, the price of caustic potash to the American soap maker and other users of this material, ranged around 7 to 8 cents per pound. Since the active entrance of the Niagara Alkali Co., into the caustic potash situation, this price has been reduced to less than 5 cents per pound, and the quality received by the trade has been far better than formerly received by them from foreign manufacturers, both of which features are directly due to the competition of the Niagara Alkali Co.

In view of the greatly reduced price, and the largely increasing business, the Niagara Alkali Co., has decided to again increase its productive capacity and work is now proceeding on the construction of an addition to their plant, which will treble its present size, thus giving them a productive capacity of nearly 20 million pounds of caustic potash per annum.

In order to provide for this enlargement, they have also arranged to increase their capital stock to $1,750,000, all of which has been subscribed for.

This, of course, is anything but good news to the importers of foreign made material, but should be heartily welcomed by the American manufacturers who are consumers of this product, as they are thus assured an ample supply of this hitherto difficultly obtained material.

Furthermore they are assured of absolute safety in placing their contracts for the domestic material, thus doing away with the possibility of having to pay duty, should any be imposed on the imported material.

All those who have been in the habit of placing contracts for foreign caustic potash on account of the danger of not being able to secure their supplies during mid-season, unless possessed of such contracts, will now find themselves in the gratifying position where such action is unnecessary, as they will be able to secure their supplies at any time direct from the Niagara Alkali Co. or through regular jobbers.

The Niagara Alkali Co., has been demonstrating to the thorough satisfaction of such soap manufacturers, and other users of caustic potash in this country as were inclined to prefer the foreign material, that their potash is absolutely satisfactory. For this purpose they employ the services of an expert soapmaker, and at the request of any prospective customers, they have been sending him to make at their plants a demonstration of the fact that Niagara Potash is all that could

possibly be desired for the manufacture of the very best quality of potash soaps.

In order to meet the competition which has been brought about in this article, it has been necessary for the Niagara Alkali Co., to make caustic potash of all grades, as well as their celebrated Niagara or 90% Potash.

In order absolutely to safeguard their customers against purchasing any low grade material in the mistaken idea that it is the same as high grade, they have adopted the plan of stamping in the cover of all drums containing 90% caustic potash their trade-mark "Niagara". On all drums containing any lower than 90%, they stamp "N A CO" Caustic Potash and give the grade in plain figures.

In order to acquaint the trade with this feature, they are issuing what is known as a "Caustic Potash Insurance Policy", consisting of pictures of these caps, which they are asking their trade to post up in a prominent place in their receiving department, so that when potash is received by them, they can be absolutely sure that they are paying only for the grade received.

Uses of Tungsten.

The metal tungsten is still classed as one of the rare elements; but of these elements it is to-day the best known and one of the most extensively employed.

The following are some of its applications: Tungsten steel, filaments for incandescent electric lamps, the use of the salts for rendering combustible materials fire-proof, and of the metal in the manufacture of projectiles.

Tungsten was first used in the making of special steel in 1855 by Jacob and Koeller in Austria. Tools made of this steel are now employed everywhere. These tools are sold under various names and possess the advantage over all others that they do not soften when subjected to the heaviest work and to high temperatures. Using this steel as a cutting tool it is possible to remove 100 feet of ¼ inch chips per minute on a high speed lathe.

In composition the tungsten alloys with iron exhibit a great variety. Those employed in the manufacture of "high speed" tools contain from 10 to 25% tungsten.

The following is an example of a tool steel:

Iron	83.0 per cent.
Tungsten	12.0 per cent.
Chromium	3.0 per cent.
Carbon	0.5 per cent.
Manganese	0.2 per cent.
Silicon	0.2 per cent.
Molybdenum	1.0 per cent.

A steel containing a considerably smaller amount of tungsten is used for springs especially for automobile springs. It is also used for armour plates.

Tungsten Filaments.

The first attempt to manufacture filaments of pure tungsten was by Just and Hanamann in 1903, who reduced the metal from a gaseous compound of tungsten and deposited it upon a carbon filament which was afterwards destroyed leaving pure tungsten.

At present tungsten pure enough to be drawn to very fine wire is made by reducing its compounds in a vacuum furnace by the aid of hydrogen. These filaments have a greater conductivity than carbon filaments and in the electric lamps give greater luminosity and at the same time consume less current.

Use of Tungsten Salts

A solution of sodium tungstate is most often employed to render cloth or other material fire-proof, and, it will not injure the most delicate colors. A solution frequently employed for this purpose consists of:

Alum	60 lbs.
Borax	20 lbs.
Tungstate	10 lbs.

in 1000 pounds or 120 gallons of water.

Because of the high specific gravity and great hardness of tungsten, and especially its alloys with nickel, it has been employed in making armour-piercing projectiles; but its price is too high to permit of any very general use for this purpose.

Tungsten 98½% pure is sold to-day for fifty cents per pound.—*Le Mois Scientifique.*

Practically all silver used in the United States for various purposes, is melted by means of oil or gas. Coal or coke furnaces are very rarely used at the present time, as it has been found that a large amount of labor is involved, together with the accompanying loss of silver, in washing the ashes. By the use of oil or gas for the melting, this is obviated.

A New Form of Mechanical Plating Apparatus.

A new form of mechanical plating apparatus has recently been patented by John W. Dow of Mansfield, Ohio (U. S. Patent, 1,034,210, July 30, 1912) and which embodies many new and useful features.

The essential feature of the apparatus lies in the use of an endless conveyor. This is made of canvas and strips of wood across. This belt is continually travelling and upon it the work to be plated is placed. The edges of the slats are sufficiently far apart to allow fitting into the teeth of sprocket wheels used for driving the belt.

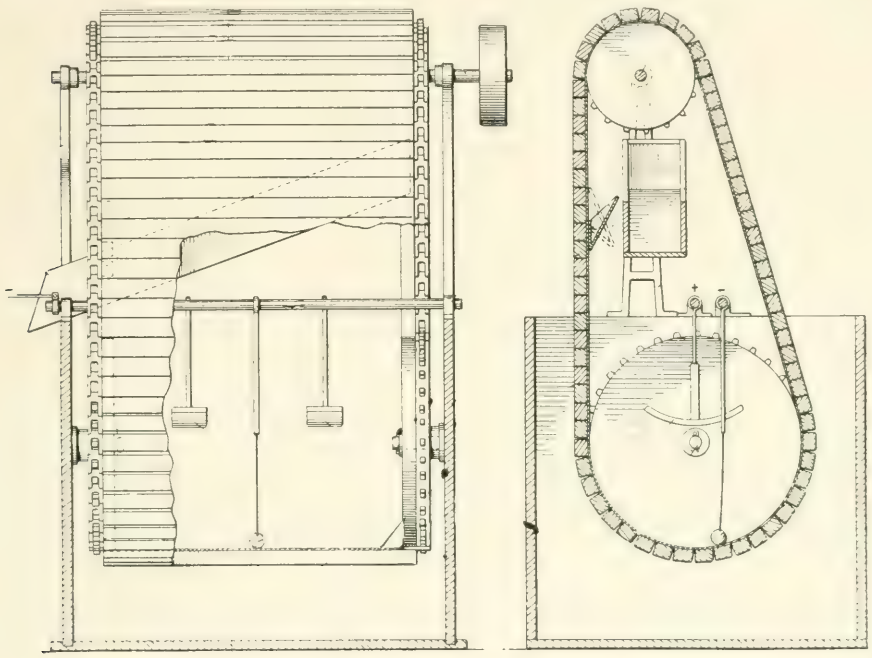


Fig. 1. One of the Modifications of the Dow Plating Apparatus.

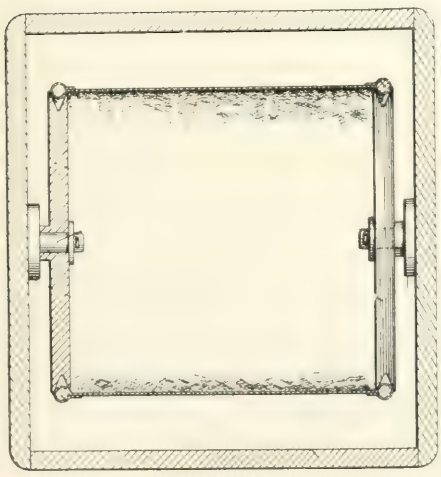


Fig. 2. Showing Method of Hanging the Apparatus.

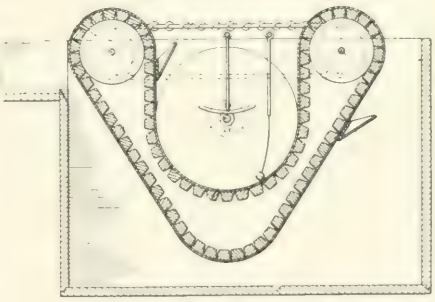


Fig. 3. Another Modification of the Apparatus.

The view of the work is unobstructed, since the pocket is open; and on account of this feature too, the voltage required is less than that required in many of the forms of barrels.

The work is removed from the apparatus

by a series of pockets traveling on the belt. When the belt is revolved in the usual manner, they will not take up the work, but if the travel of the belt is reversed, the work will be automatically scooped up by these pockets and dumped at the top of the tank into any suitable receptacle.

Distinguishing the Brasses by Color.

The composition of the brasses (copper and zinc alloys) may be readily determined, in an approximate manner, by the color. Such a method gives a brass founder a simple and rapid means for ascertaining what his brass contains. The following shows the color of the various percentages of copper and zinc:

When the brass contains 5% of zinc, it has a red color scarcely differing from that of pure copper. When 10% of zinc is present, the mixture has a true bronze color. With 15% of zinc, the brass has a light orange shade. When the amount of zinc reaches 20%, the color of the mixture is greenish-yellow and is known as "green brass." With 25% zinc, the color is practically that of the 20% mixture so that this, too, is a "green brass." Brass with 30% zinc has the true, yellow brass color. The same is found with 35% of zinc, but at about this point the yellow color begins to disappear for at 40% zinc, a reddish yellow color is found. Brass, therefore, that has a reddish-yellow shade will always contain more than 35% zinc. The "dead line" seems to be about 38% zinc, for at this percentage, the transition from the real yellow to the reddish-yellow begins.

When the zinc is increased to 45%, the color of the brass is a rich golden color and, strictly speaking, it may be called "orange." The mixture containing 50% zinc has also a golden shade, but even richer than 45% zinc alloy. At 55% zinc, the color resembles that of 14 Karat gold.

When 60% of zinc is reached, the brass has a yellowish white shade, and as the quantity increases, the color becomes white and finally gray.

It becomes possible, then, to make an approximate determination of the composition of a brass by the color. If it is very soft and red or orange color, then the amount of zinc is from 10% to 15%. If greenish-yellow, the quantity of zinc ranges from 20% to 25%. The true brass color is found when the zinc amounts to from 30% to about 38%. If, however, it is found that the brass is hard and has an orange yellow color, then the zinc must be present in an amount greater than 38%. To cite an instance of this kind, a concern may be purchasing yellow-brass ingot. If, upon cutting or filing it, the color is found to be orange, then the zinc in it is excessive and may run from 40% to 50%.

In comparing the color of the brasses, a highly polished surface is not as suitable as a dead one for the reason that false reflections are apt to deceive the observer. A surface that has been filed or ground is preferable and in order to avoid tarnishing, the metal should be freshly cut when a comparison is to be made.

Lead Lined Piping on Ship-Board.

Description of its Manufacture.—In repairing pipe lines brass, iron and copper piping may be lined, but for new work lap-welded steel casing (being much cheaper than seamless-drawn tubing and equally as satisfactory) is used. The inner surface of this casing is first made entirely smooth by a revolving chain mop on a flexible spindle attached to a pneumatic drilling machine. In the case of old piping this is first cleaned and the pits closed by solder, wiped off smooth, and tested to a pressure of 300 pounds.

All joints are made with flanges. When repairing a pipe having several different bends it is sometimes necessary to cut the pipe at the bend and to fit flanges. The flanges are counter-bored to about ¾ inch from the face of the pipe, depending on the size of the flange, and about 1/10 inch deep, or the thickness of the lead which is to be flanged over, *care being taken that the edge of the casing over which the lead is bent is carefully rounded with a file.*

The lead tubing used is about ¼ inch smaller than the pipe to be lined. Where bends are encountered it is necessary to pull the lining through. This is done by means of a rope led through the lead tube and then through a plug and secured by a knot. The lead tubing is then filled with dry sand, covered with tallow and, while the outer tube is tapped with a wooden mallet, pulled through by means of

a machine operated by air or water pressure at from 15 to 100 pounds pressure, according to the nature of the bend. Bad bends are warmed slightly by means of a gasoline torch.

The plug, sand and rope are then removed and the lead examined by inserting a small electric portable. If no defects appear the tubing is tapped over into the recess of the flange at one end of the pipe only. The other end of the lead pipe is sawed off about 6 inches longer than the pipe that is to be lined and a plug is fitted.

The air cock shown is opened and the pressure turned on slowly. When the air is all out the plug is closed and the pressure very gradually run up to 300 pounds. The lead pipe becomes shorter under this pressure which is then removed and the lead fitted into the recess of the flange at the other end of the pipe. The piece of piping is then blank-flanged and treated to a final pressure of 600 pounds per square inch.

Weight and Cost.—In order to reduce weight the lining should be no thicker than absolutely necessary. For sizes given in the following table the weight and thickness there given have been found very satisfactory:

Outside diameter of pipe.	Weight of pipe	Thickness.
1½ inch	2	.088
2	3	.099
3	4	.088
4	5¾	.095

The weight of such a system is about 5 per cent. less than that of a similar installation of copper piping. The cost is about 50 per cent. less.

Further Points of Interest Thus Far Determined.—1. The lead piping should be shipped from the works of the manufacturer very carefully packed on wooden mandrels to prevent crushing and distortion.

2. In the case of galvanized-iron, wrought-iron or steel tubing, the elbows, tees and other fittings are not lead lined. It has been found necessary to lead line fittings under no circumstances.

3. Old pipe has been lined with lead where the radius of the bend was twice the diameter, but it is better practice to bend the tubing to be lined to about 4 or 5 times the diameter.—*Journal American Society of Naval Engineers.*

Nickel Wire for Spark Plug Points.

In the early days of electrical science, one would look with suspicion upon the use of anything but platinum for contact points of any piece of apparatus. When the automobiles first came into use the use of the so-called "spark-plug" called for a condition similar to be satisfied. At first, the "make and break" form of spark was used and in which a low tension current, comparatively speaking, could be employed. The points in this form of plug, at first touched and then were pulled apart, so that a spark could be produced without the use of a high tension current.

The appearance of the "jump spark" plug in which the current of high tension jumps the gap between two terminals, necessitated the use of a different form of appliance for this purpose so that to-day every automobile is equipped with plugs for producing a "jump spark". The points of the plug, through which the current passes, are about a sixty-fourth of an inch from each other, and this constitutes the gap through which the spark must pass.

When the "make and break" plug was used (and it was the first kind of plug), platinum points were really necessary as the contact required constant brightness. With the "jump spark" the same condition would naturally appear to exist. When this form of plug was first put on the market, the wire, forming the terminals, was made of platinum as every maker thought it necessary. This made the plug somewhat costly and the platinum was then cut down. The price of platinum then began to increase by leaps and bounds until its use in a plug is almost out of the question at the price it is sold. Such a state of affairs necessitated a change and a substitute for platinum was sought. Nickel seems to be the logical material and it was tried and finally used, until to-day there is probably but one spark plug manufacturer who uses platinum in the terminals; and it is believed that he does it for an advertising feature more than from any superiority of results.

In the plug giving the "jump spark", in which a high tension current is used, the need for platinum terminals or points does not seem to exist and a wire with a high melting point is more essential. Except for rusting,

ordinary iron wire will answer. Nickel has a high melting point, does not rust and will keep bright for some time. On this account it was adopted for the point in early plugs of the "jump spark" system. The following is the analysis of a sample of nickel wire made in Germany and used as the wire terminals of spark plugs:

Nickel	98.35%
Iron	0.83%
Manganese	0.69%
Copper	0.13%

As previously mentioned, the matter of fusibility is the principal qualification of spark plug points. The high tension current will jump quite a gap and the points need not be as clean as in the case a low tension current is employed. In the case of any kind of metal, soot and carbon are the things that interfere by coating over the points and practically insulating them. Platinum is just as susceptible to the sooting as any other metal.

Although pure nickel was first used for spark points, another kind of nickel alloy has, within the last few years, been employed for the work. It is an alloy of nickel and chromium and melts at a much higher temperature than pure nickel. For this reason it is employed. Pure nickel is also used to a large extent at the present time.

An Ink That will Conduct Electricity.

An inventor has recently patented an ink which will conduct electricity after it has dried upon the paper in the form of writing. This is accomplished in a very simple manner:

Artificial graphite is the foundation of the ink and this must be of the variety known as "deflocculated". It is graphite that has been treated so that it will remain in suspension in water and is known in the trade as "Aquadag".

This variety of artificial graphite is used while in suspension in water, and to give it body a little gelatine is put in. Glue or gums will also answer. It is claimed that words written on paper with this ink will, by connecting the ends with terminals, conduct an electric current.

The standard silver plating solution used in the United States for plating flat-ware contains 3 oz. of silver and 3 oz. of free cyanide per gallon.

Zinc-Dross and What It Is.

The term zinc dross is now extensively used in the scrap metal trades and is one of the misonomers that frequently creep in a language unawares. The singular thing about it is that the material is not a dross at all in the true sense of the word. Strictly speaking, a dross is a mixture of an oxide and metal and is that which results in skimming the top of a molten metal. Tin dross is thus obtained, lead dross is another example and the mass obtained from a similar skimming of zinc should be so designated but it is not.

The term zinc-dross is that applied to an alloy of zinc and iron containing from 2 to 4 per cent. of iron. It results when zinc is melted in an iron kettle and iron tools are used in stirring and ladling it. The zinc takes up the iron and becomes thick and pasty until it is finally necessary to remove it from the bottom of the kettle. The presence of the iron makes zinc less fusible and so that it becomes pasty at the temperature of the molten zinc.

Zinc dross, therefore, is not a dross at all, but an alloy of zinc and iron.

Making Porous Metals for Bearings.

A writer in *Comptes Rendus* gives a method of making porous metals which can be used for bearings, packing or accumulator plates. He gives a case of this nature in which he allowed an alloy of 50 per cent. of antimony and 50 per cent. of lead to cool to below 450° C. At this temperature the antimony begins to crystallize out. The mass was then subjected to centrifugal motion and the liquid eutectic, which does not finally solidify until a temperature of 225 is reached and which then contains 87 per cent. of lead.

A tin and lead alloy was made and treated in the same manner. The alloy contained 20 per cent. of lead. It was suggested by the author that such metals might be used to form semi metallic alloys by filling the pores with fats, resins or enamels; while by the inclusion of lead oxide in the case of porous lead, accumulator plates could be produced.

Agitated nickel plating solutions are always preferable to still solutions when rapidity of deposition is desired.

Difficulty in Electrogalvanizing Over-Pickled Cast-Iron.

The rapid growth and now extensive use of electrogalvanizing has been instrumental in bringing out many difficulties. Some of them are easily discovered and remedied, while others are quite difficult to locate.

A rather common difficulty and one that frequently perplexes many platers, is the impossibility of depositing zinc upon cast-iron under certain conditions. A large lot of cast-iron goods, all the same are brought into the plating room. They are started through the various operations and the first days work is good. The next day may be different as it is found that the zinc will not cover the iron at all well. What renders this so perplexing to the plater is the fact that the cast-iron is all the same and while one piece takes the zinc well, another will not.

The reason for this apparent paradox is that the iron which does not take the zinc deposit has been "over-pickled". Cast-iron goods are not always pickled, but are tumbled instead. Even then they should be given a light pickle at least, as the corners are usually not sufficiently tumbled to remove all the sand and rust. It is necessary, at any event, to have a clean iron surface and this can be accomplished by tumbling alone in some instances, or by the sand-blast or by pickling. Frequently a combination of all three may be advantageous. Pickling, however, is usually necessary, no matter what else may be done.

When the cast-iron is pickled, the acid (either sulphuric, muriatic or hydrofluoric) attacks the iron. Cast-iron contains a large amount of carbon, both in the form of graphite and as combined carbon. As the iron is dissolved by the acid, this carbon (both the combined and graphite) are left on the surface. The more prolonged the pickling, the greater the amount of carbon left. When iron has been pickled so that the amount of carbon on its surface is considerable and almost completely covers the surface, it is called "over-pickled".

Such "over-pickled" iron can be recovered by brushing and scouring until the carbon is removed, but if it is not given this treatment, but is put directly into the electrogalvanizing solution, the zinc will not deposit on it well, or perhaps not at all. The carbon on the surface, being a poor conductor, will not take the zinc. The remedy, of course, is obvious: Either scour and brush off the carbon from the surface, or not to allow the articles to remain so long in the pickle.

Method of Producing Fine Dip-Tinning.

To produce a fine job of dip-tinning, it is necessary to have two tinning kettles. The first is used to coat the iron or steel with the tin, irrespective of the smoothness of the surface. The whole article, however, must be covered with tin. The steel or iron is previously made bright by pickling, tumbling, sand-blasting or other treatment, and then dipped into a chloride of zinc flux. It then is immersed in the tin kettle and allowed to remain for a few minutes when it is taken out and shaken to remove some of the surplus tin and prevent the articles from adhering.

The second operation is called "retinning" and is used to give the fine, bright surface to the goods. This kettle contains tin covered with tallow and the articles are dipped into it singly and allowed to remain until the tin becomes even. The articles, held in tongs, are taken out and given a quick jerk to remove the drop of tin at the bottom. In this manner a very fine surface is produced. The iron or steel, however, must be smooth to obtain a good surface.

Graphite galvanizing kettles have proved satisfactory and are now used in one large wire manufacturing establishment by whom they were patented. They are employed instead of iron and the amount of zinc dross which forms is very much less.

Cast-iron or malleable-iron, when brass or copper plated, gives a large amount of trouble on account of "spotting-out". This may be partially overcome, at least, by first nickel plating the iron, and then brass or copper plating over it.

Nickel salts are now made by dissolving the oxide of nickel in sulphuric acid. The old method of dissolving metallic nickel in nitric acid and then evaporating if off with sulphuric acid is no longer used as it is very difficult to drive off the last traces of nitric acid. Under such conditions, when the nickel salts contain traces of nitric acid, the nickel deposit comes dark colored.

Questions and Answers.

QUESTION No. 1184. In making a verde-antique by the corrosion process, I have been unable to obtain the color desired. It comes a yellowish-green and sometimes a very light green. I want a dark green. The formula for the corrosion solution was formerly given in THE BRASS WORLD and consists of sulphate of copper, sal-ammoniac, salt, glycerine etc. How can the dark colors be obtained, or how can the yellow shade be avoided?

Answer. From the character of the work you are doing, we presume you are copper plating brass and then corroding the copper. The reason for the yellowish-green color after corrosion is that the copper deposit is attacked which, of course, gives the yellowish-green shade. It is impossible to obtain the dark shade on copper and the only way is to use, for a base metal a bronze high in lead. It has been found that the bronzes containing a large amount of lead, such as, for example, the Japanese-bronzes, always give a dark, rich green after corrosion. The lead in the bronze is, apparently, the cause.

QUESTION No. 1185. We have accumulated cores and core sand which have been knocked at our brass foundry a large amount of old out of castings, and it has occurred to us that this possibly might be reclaimed and again used in the production of cores. Can you give us any information or advise on this subject as to whether it is practical to try and re-use this old core sand, and in what quantities to make it a paying proposition?

Answer. A certain amount of old core sand may be used in the making of new cores, if it has been well burnt. We do not know whether you use an oil core or not, but if so, would advise using very little. Sand is cheap and it is usually considered unprofitable to carry economy too far. As we previously mentioned, if your sand has been well burnt, you can use a certain proportion (depending upon the character of the core) in making new cores.

QUESTION No. 1187. We want to make some hard lead name plates and wish to know whether these cannot be cast in sand the same as a brass casting? What mixture shall we use for hardening the lead as pure lead is too soft?

Answer. Use a mixture composed of the following:

Lead	87%
Antimony	13%

You can cast the plates in sand, but you will find the surface more or less rough as such a low melting metal takes every detail of the sand, even each grain. It is better, and cheaper if you have many to make, to use a bronze mold. This can be chased out so that the surface is smooth, and then your plates will be smooth and of excellent appearance. We cannot advise casting them in sand, as we do not believe you will find them smooth enough.

QUESTION No. 1188. I wish to make a pickle, not a dip, for use on low brass after it comes from the annealing furnace and is covered with scale. What acid is the best?

Answer. The best pickle for removing the scale or oxide from low brass is the following:

Water	9 gallons
Sulphuric Acid	1 gallon

If this is used warm or hot, it will work more rapidly, but it works all right cold although a little slower. It will not leave the brass bright, of course, and the surface will be mottled although clean and free from oxide. A dip will then brighten the surface.

QUESTION No. 1190. Is there any metal except aluminum that will improve the quality of a galvanized coating? We are using a small quantity of aluminum in our zinc and it has been a success from the start. The galvanizing is brighter and smoother than when no zinc is used.

Answer. As far as known there is nothing that will take the place of aluminum in galvanizing. We have never found anyone using other metals, although possibly there might be one or more which would give superior results. Aluminum is so satisfactory for this purpose that there seems to be little desired. If you wish to exhaust the subject, however, you will have to do some experimenting with other metals which have a strong affinity for oxygen.

QUESTION No. 1191. Do you think it possible to make valves out of aluminum which will have to stand 75 lbs. per sq. in. pressure? We have tried a mixture composed of 92 lbs. of aluminum and 8 lbs. of copper; and likewise a mixture composed of 82 lbs. of aluminum, 15 lbs. of zinc and 3 lbs. of copper, but with no better results. Is there any particular mixture for this class of work?

Answer. You will not be able to make a valve such as you mention for standing 75 lbs. per sq. in. pressure, out of any aluminum alloy. The difficulty is in the fact that aluminum is very porous, on account of the oxide contained in it and which acts as channels through which water, other liquids or air can pass. It is the "nature of the beast." Of course, the thicker the casting the less apt it is to leak, and this is your only solution of the problem. We fear that you will not be able to make the valve unless it is sothick and bulky as to be unfit for use. The mixture which you mention above containing zinc, is the best for standing pressure, but we feel quite sure that you cannot do what you wish.

QUESTION No. 1192. What is the material called "Goldine" and used for making cheap watch-cases?

Answer. There are many names of this kind for imitation gold alloys. "Goldine" is one of them and consists of 90% copper and 10% zinc. It is also frequently called "Gilding."

If too light in shade, then less zinc can be used and the following mixture taken: Copper 92% and zinc 8%. This latter mixture has a redder shade than the other. These mixtures can be obtained from any brass rolling mill and regularly made for many kinds of work requiring a gold colored metal. There is another mixture which has a very pleasing color and is an imitation of gold. It is made of the following ingredients:

18% German Silver	100 lbs.
Copper	100 lbs.

The two are melted together and a rich oreide color is produced. The resulting alloy is as follows:

Copper	81%
Nickel	9%
Zinc	10%

If desired, of course, the mixture may be made from new metals in this proportion.

QUESTION No. 1193. In making silver deposit work, what causes the design, painted on the glass with the silver powder and the flux (with turpentine as a vehicle) to flake off when heated in the muffle used for firing? This has been one of our difficulties; we are not having it all the time, but now and then.

Answer. There may be several reasons for the flaking or scaling off. One is the wrong heat used in firing. Unless the flux fuses and adheres to the glass, the design will come off, either before or after plating with the silver. Another is the use of an unsuitable flux. Unless the flux is sufficiently fusible, it will not melt; and unless it does not, it is readily apparent that it will not adhere. Another possible cause is the use of too little flux in proportion to the silver. Or, in other words the employment of so little flux that there is practically nothing to fuse on the glass. With these suggestions you will have to determine how to overcome your difficulty.

QUESTION No. 1194. Is mercury used at all at the present time for silvering mirrors? We have been informed that it is to a limited extent, but that it is gradually becoming obsolete.

Answer. As far as we know, there is no concern in the United States silvering mirrors by the use of mercury. At one time (many years ago) it was exclusively employed and was accomplished by spreading tin-foil on the surface of the glass, covering with mercury and then squeezing out the excess of mercury. The present method dispenses with mercury entirely and the coating on the mirror is composed of pure silver. It is deposited on the glass by a silver solution. This solution deposits its own silver without the use of any electric current.

QUESTION No. 1195. What are the properties of titanium? We hear much said about it at the present time and would like to know what it is good for.

Answer. The properties of titanium are as follows:

Titanium is very widely distributed on the earth's surface and is found mainly in combination with iron. Such ore is called "Titanic Iron Ore." The melting point of titanium is very high and is stated to be 3450 F. which is somewhat higher than platinum. It has a strong affinity for oxygen and is, therefore, a strong deoxidizing material. Its most remarkable property, however, is its affinity for nitrogen and it seems to have the property of removing nitrogen gas and its compounds from metals. Nitrogen, as has been discovered within the last few years, plays an important part in metallurgy and many metals absorb it from the air during the melting.

QUESTION No. 1196. What is the best method of producing the Japanese-bronze finish? We have some brass fixtures and the finish called for is what is known as the "Japanese". If it is anything expensive we will be unable to use it as the price at which we sell the goods is so low that we cannot afford to put any extra work on them.

Answer. The Japanese bronze finish or "Jap Bronze" as it is frequently called, is very simple to produce and is one of the cheapest of finishers. It is best carried out in the following manner: Give the article a light copper deposit in a cyanide copper solution and then a deposit of about 30 minutes in an acid copper solution. Now rinse and immerse in a liver of sulphur solution (used cold) made up as follows:

Water	1 gallon
Liver of Sulphur	¼ oz.

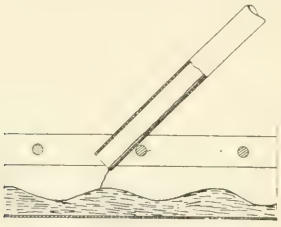
Immerse work in the solution and when the first discoloration takes place, remove, rinse and immerse in a weak acid pickle composed of 1 part of muriatic acid and 10 parts of water. This will "set" the color. Now scratch-brush dry and the mahogany red will be obtained. If the color is not sufficiently deep, then the articles can be returned to the liver of sulphur bath and the color carried a little further. The object is to stop the color when the right shade has been obtained and for a "Japanese-Bronze" this point is produced when a slight discoloration has been obtained. The principal error is to carry it too far or to use too strong a liver of sulphur solution.

QUESTION No. 1197. I have recently made some chloride of platinum solution by dissolving metallic platinum, which I purchased, in aqua-regia. The solution is quite red and all that I have previously made is yellow. Is this due to wrong treatment or is the acid impure?

Answer. Your difficulty is in the fact that your platinum contains some iridium. This metal is used to harden platinum and the so-called hard platinum of commerce (that the most extensively used) contains from 5 to 10 per cent of iridium. The chloride of iridium is red, hence the coloring of the chloride of platinum. Pure platinum chloride is yellow, somewhat resembling chloride of gold.

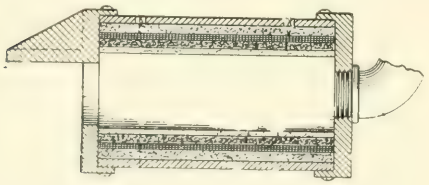
Patent Abstracts.

1,034,687, Aug. 6, 1912. APPARATUS FOR REMOVING SUPERFLUOUS METAL FROM METAL COATED BODIES. Gottfried Buchert of Laurahutte, Germany. An apparatus for removing the excess of zinc or tin from such articles as iron pipes. The application is more particularly to galvanized



pipes as this is carried on so much more extensively than tinning at the present time. The machine takes the tube after coating and subjects it to rolling, pounding and transverse movement so that the excess of zinc is loosened on the interior and may be removed by holding the pipe on end.

1,035,595, Aug. 13, 1912. ELECTRIC FURNACE. Manfred J. Johnson of Naugatuck, Conn. An electric furnace or muffle intended

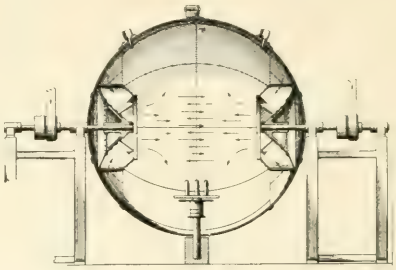


for dentists' use, small hardening. The furnace is of the resistance type and can be used with or without a transformer. A quartz tube is used for the lining of the furnace.

1,033,821, July 30, 1912. PROCESS OF DECORATING ENAMELED METAL. George R. Meyercord of Chicago, Ill. A decorative film is placed on the enameled metal surface and held by means of a size. The whole is then heated to about 500 F. to volatilize the binder and sizing, after which the heat is increased sufficiently to cause the colors of the decorative film to fuse into the enamel itself.

1,035,919, Aug. 20, 1912. REDUCTION OF BORON COMPOUNDS. Frank J. Tone of Niagara Falls, N. Y. A mixture of calcium borate, carbon and iron are heated in an electric furnace and an alloy of iron and boron is obtained. This is known as "ferro-boron."

1,034,761, Aug. 6, 1912. PROCESS OF COATING OBJECTS WITH SUBDIVIDED MATERIAL. Franklin F. Bradley of Chicago, Ill. Assignor to Bradley & Vrooman of Chicago, Ill. An apparatus for coating articles with bronze powder. They



are placed in an arrangement like a spherical tumbling barrel with the bronze powder. The tumbling barrel however is stationary and the article in it does not move. The process is applied more particularly to bronzing brass beds. A couple of fans operated by power, distribute the bronze powder over the surface of the bedstead contained in the receptacle.

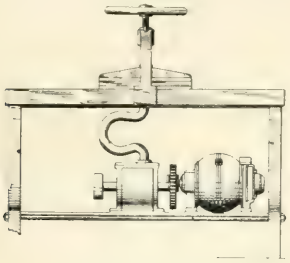
1,035,956, Aug. 20, 1912. CASTING MACHINE. James W. Furlow of Los Angeles, Cal. A machine for casting sash-weights in a permanent sand mold. The weights are supposed to come out of the mold in a finished condition.

1,033,967, June 30, 1912. BRAZING BURNER. William H. Van Horn of Baltimore, Md. Assignor to Clarence M. Kemp of Baltimore, Md. A brazing burner adapted for use with gasolene gas and air. Two independent

pipes are used, each having a supply of gas under pressure. One is used as the pilot flame and the other as a jet to force the gas through it. A long pencil flame is thus formed. If burned in the ordinary burner, the gasolene flame is extinguished by the blast.

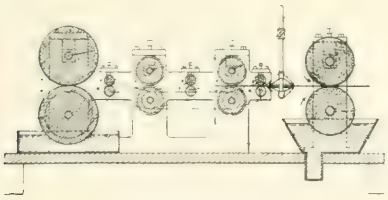
1,036,526, Aug. 20, 1912. ENGRAVING MACHINE. Thomas George Cordi and Leander Lee Cordi of Roseville, Cal. An engraving machine for duplicating engraved work. The object is to provide great accuracy in following the design

1,034,880, Aug. 6, 1912. MANUFACTURE OF ELECTROTYPE PLATES. Charles P. Cottrell of Westerly, R. I. Assignor to C. B. Cottrell & Sons Co. of the same place. The invention relates to a new method of backing up electrotype shells so that a better plate can



be produced and in a more expeditious manner. The novelty lies in the use of suction to hold the electrotype shell firmly against the surface upon which it rests, so that there will be no tendency to warp or become distorted. A pump is used to hold the shell against the plate, by creating the necessary suction underneath it.

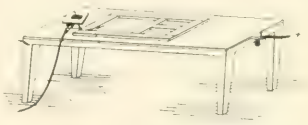
1,035,242, Aug. 13, 1912. COATING METAL SHEETS. George Russel of McKeesport, Pa. Assignor to the Pittsburgh Can Co. of the same place. A machine for coating tin-plates, black sheet iron plates or other kinds of sheet metal with enamel. The



enamel is simply a lacquer and is applied to the sheet metal by means of rollers as shown in the illustration. After the sheets have been coated as desired, by means of the rollers they are baked in an oven under the same conditions that lacquer is baked.

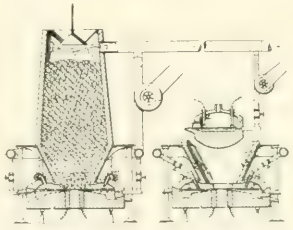
1,033,090, July 23, 1912. METAL SCRAP COMPRESSING MACHINE. John Dunn of Streator, Ill. Assignor to the Vulcan Detinning Co. of New York City. A special form of machine for cabbaging or compressing tin plate clippings and scrap into cabbages or bales. The machine works by hydraulic pressure and one of the novel features lies in the manner of releasing the compressing plunger when it has been caught in the scrap.

1,034,290, July 30, 1912. METHOD OF ELECTRIC WELDING. Harold F. Parish of New York City, Assignor to the Grinden Art Metal Co. of the same city. The invention relates to a simple and convenient



form of apparatus for electric welding which can be used in the shop in a manner similar to a soldering iron. This is accomplished, in a certain sense, by the employment of an iron electrode, the stream of molten iron falling from which partially does the welding.

1,034,784, Aug. 6, 1912. METHOD OF PRODUCING REFINED METALS AND ALLOYS. Albert E. Greene of Pueblo, Colorado. Assignor to the American Electric Smelting & Engineering Co., of St. Louis, Mo. A method, using a special form of furnace, for removing undesirable metals and elements from metals and alloys, by selective



oxidation while maintained in a molten condition by an electric heating current. It is claimed that the temperature may be controlled by the use of the electric furnace better than by any other means, and for this reason it is used for carrying out the selective oxidation. While applied more particularly to iron and steel, the process is equally applicable to the non-ferrous metals and alloys.

1,036,239, Aug. 20, 1912. APPARATUS FOR PREPARING OLD AND NEW MOLDING SAND. George Hoffman of Hanover-Hainholz, Germany. An apparatus for treating molding sand for use in molding. The sand is taken from the floor, broken up, sieved, moistened and deposited on the floor again so that it can be immediately used by the molders. The apparatus is an elaborate one and would be suitable only for large establishments.

Trade Items.

The E. F. Casey Brass & Aluminum Foundry has opened a new foundry at 559 West Van Buren street, Chicago. E. F. Cosey is the proprietor.

The Bridgeport Brass Co., Bridgeport, Conn., are designing a new form of automobile carburetor which they will place on the market in the near future.

The Tolhurst Machine Works, Troy N. Y., manufacturers of centrifugal machines for drying out metal goods, have recently installed two new machines in the United States Mint at Philadelphia, Pa., for drying out coin blanks after pickling.

The Monarch Engineering & Manufacturing Co., 1200 American Building, Baltimore, Md., makers of the celebrated "Steele-Harvey" melting furnaces, desire to call the attention of the trade to the line of core-ovens, drying-ovens and other similar appliances that they are manufacturing. These ovens have been placed in many large establishments, not only for drying cores, but for a large variety of other kinds of drying. Oil, gas or coal may be used in the ovens if desired, and the Monarch Engineering & Mfg. Co., will be pleased to send their descriptive matter to anyone interested.

The Grasselli Chemical Co., Cleveland, Ohio, the extensive manufacturers of chemicals of all kinds, and also one of the largest zinc producers, are to establish a warehouse in New Haven, Conn., for the distribution of their goods in the section surrounding this city. A dock has been secured and acid tanks are to be erected for holding acid. An office will be maintained at this warehouse so that telephone orders may be promptly shipped. It is expected that the improvements will be finished by the last of October. Up to this time the Grasselli Chemical Co., have not been able to take care of as large a portion of the acid trade in New England as they desired to do as the freights from distant points militated against them, but when the new warehouse and tanks are erected, they will be able to take care of the trade in a very prompt manner.

The Niagara Alkali Company of Niagara Falls, N. Y., manufacturers of caustic potash and chemically pure muriatic acid by the electrical process, recently increased their capital stock to $1,750,000 and elected the following officers: President, Waldemar Schmidtmann of Schloss Grubhof, Austria; vice-president and general manager, H. D. Kuhn of Buffalo, N. Y.; secretary and sales manager, F. O. Geyler of Niagara Falls, N. Y.; factory manager, E. M. Sergeant of Niagara Falls, N. Y.; chemical engineer, A. Sudry. The board of directors consist of Waldemar Schmidtmann, T. C. Meadows, H. D. Kuhn, F. O. Geyler and E. M. Sergeant. T. C. Meadows is the chairman of the board of directors.

The Pratt & Cady Co., of Hartford, Conn., one of the largest manufacturers of valves in the United States, have gone into the hands of a receiver.

The Cadillac Motor Car Company has purchased property on West Fort street, with 100 ft. frontage and 30 ft. depth, for a large addition to its body-building plant.

The Bridgeport Deoxidized Bronze & Metal Company, Bridgeport, Conn., has made tentative plans for the erection of a foundry building adjacent to its present works, to be 90 x 178 ft. In it thirty-two large furnaces will be installed, adding to the company's output 40,000 lb. daily.

The Consolidated Casting Co., of Mechanicville, N. Y., (formerly the W. F. Greene Co. of the same place) which recently went into bankruptcy, has been taken over by a new firm called the Deeds & Lynd Company who will continue manufacturing as before. Mr. Deeds was formerly connected with the Troy Nickel Works and Mr. Lynd was with the W. F. Greene Co., and afterwards with the Consolidated Casting Co. A line of stove trimmings, piano hardware and other small metal goods will be made. Nickel plating will be carried on extensively.

The Michigan Copper and Brass Company of Detroit, Mich., has just sent out checks in payment of four dividends on the preferred stock of the Company. This company has been in operation just five years this week. In the first year of its existence, there was the panic of 1907; there were declines in the price of raw material, and losses from other sources that always accompany the inauguration of a new industry, so that in the first two years no dividends were paid. The preferred stock, however, is cumulative and the company has now paid off, not only the loss incurred in the early part of its history, but also all the dividends that were passed. It is considered rather remarkable that inside of five years this business should have put itself on such a substantial footing.

The stockholders and directors of the Charles A. Bennett Company, manufacturing silversmiths with a place of business in Taunton, Mass., held a meeting in the law office of Albert R. White, last week to consider a proposition tending to the removal of the business to New Milford, Conn. After the matter was discussed at length, it was voted to leave the affair in the hands of Mr. White, to whom the company had made an assingment a few days before. Mr. White was to receive the offer of the New Milford Board of Trade for the purchase of the business and if in his judgment the offer was not sufficient he was to close the negotiations at once. If, however, the offer was such as in his judgment might be considered an advantageous one, he was to communicate it to the stockholders and creditors for final action.

The Goshen Art Metallizing Co., of Goshen, Ind., is now engaged in metallizing plaster of paris figures, statuary, and figures made of this material.

M. L. Oberdorfer, brass founder, Syracuse, N. Y., has taken bids for and will soon start construction work on a one-story and basement foundry building, 48 x 76 ft., which he will erect on East Water street.

Rothen & Son, watch case makers, etc., is the name of a new firm that has embarked in the jewelry business in the Arlington building, Tenth and Walnut streets, Kansas City, Mo. Mr. Rothen was with Meyer Jewelry Co., for ten years or more.

The Ansonia Mfg. Co., of Ansonia, Conn., Chas. H. Jockmus, proprietor, are now manufacturing automobile windshields on an extensive scale. They are now making a new type which can be controlled with one hand and can be attached to the cowl of the dash direct.

Charles C. Hughes Company, 628 Race St., Philadelphia, Pa., have recently placed on the market a new type of electric lamp of the arc type, but in which no magnets are used. The carbons are regulated by the expansion of a wire, of special composition, and require no attention. A singular feature is that the lamp burns equally as well on an alternating as on a direct current. No transformer, therefore, is required.

The Gaynor & Mitchell Mfg. Company, Bridgeport, Conn., manufacturer of stamped metal goods of all descriptions, is planning to occupy its new factory in the early autumn. The site is adjacent to that of the Baird Machine Company, on Stratford Avenue at the front, and on the main line of the New York, New Haven & Hartford Railroad at the rear. The neighborhood has the nucleus of an important manufacturing community, the Baird Machine Company's shops, already completed; the factory of the Weidlich Bros. Mfg. Company; the foundry and shops of the United Foundry & Machine Company, together with an important textile mill, and the Gaynor & Mitchell works, constituting a manufacturing center in themselves.

The brass rolling mills, says the Boston News Bureau, have never been so busy. The American Brass Company has long been the largest individual consumer of copper in the world, and, it is understood, has been for some time consuming copper at the rate of 7,000 tons monthly, or between 160,000,000 and 170,000,000 lb. a year. In Europe the nearest approach to this total has thus far been in the neighborhood of 70,000,000 lb. consumed by the Allgemeine Elektrictats Gesellschaft of Germany, the greatest consumer abroad. Included in the American Brass Company's total must be considered large tonnages ordinarily credited to the General Electric, Westinghouse and other leading consumers, for they use copper in finished form to a large extent which has been prepared for them by the first-named company.

The National Lock & Stamping Co., has been incorporated at Grand Rapids, Mich., with a capital stock of $10,000 to manufacture a line of metal specialties.

The C. E. Fenniman Mfg. Co., of Newark, N. J., manufacturers of sterling silver novelties, have equipped their factory with electric power. Heretofore steam was used as the motive power of their factory.

The Jackson Rim Company, Jackson, Mich., recently incorporated, has begun the construction of its new plant. The building will be 80 x 400 ft. and of cement construction. Automobile rims will be made and electro-galvanizing carried on.

The Titanium Alloy Mfg. Company, Pittsburg,Pa., shipped 3,836,818 lb. of titanium alloy to various steel manufacturers in 1911. Of this total, 1,854,218 lb. went to makers of open-hearth and crucible steel and 1,982,600 lb. to makers of Bessemer steel. This alloy is used in amounts varying from 0.2 to 0.6 per cent. in the treatment of steel. Taking 0.4 per cent. as the average thus used, the amount shipped in 1911 would be sufficient to treat 428,216 gross tons of steel.

Eleazer D. Jorjorian, of Worcester, Mass., is restrained from carrying on a plating business in Worcester for ten years in an injunction which has been granted the Acme Plating Company of Worcester by Judge Frederick Morton of the Superior Court. It was claimed by the Acme company in its petition for the injunction that Jorjorian entered into an agreement not to carry on a plating business that would be injurious to the firm.

The Keyless Lock Company, Indianapolis, will build a two-story fireproof foundry, to cost $75,000, to be used exclusively for the manufacture of brass and aluminum castings and operated independently of the present plant which manufactures metal furniture. No timber is to be used in the construction of the building. The equipment is to be the most modern. Oil furnaces will be used instead of coke furnaces. A large battery of molding machines and a sand-blast will be installed. The capacity of the plant will be 10,000 lbs. a a day.

The Parcels Post system, which has been given so much thought, both *pro* and *con*, by those in favor of it and those against it, has finally become a law and will go into operation on January 1st. 1912. It will then be possible to send merchandise by mail at a comparatively low cost. The United States is to be divided into a number of zones and the postage with then vary with this zone. The rates of postage will vary from five cents for the first pound and 3 cents for each additional pound or fraction thereof, up to 11 cents, depending upon the zone in which the post-officie is located. There will be a limit of weight of 11 pounds and the size of the package cannot be greater than 72 inches in length and girth combined. It is expected that this Parcels Post system will benefit rural inhabitants more than others.

The Buescher Band Instrument Company, Elkhart, Ind., is erecting a one-story brass foundry to be 25 x 40 ft.

Fire recently destroyed the plant of the Ohio State Stove Co., of Columbus, Ohio, manufacturers of stoves. Temporary quarters were secured and the plant will be rebuilt at once.

The Northern Bolt & Screw Company, Owen Sound, Ont., J. H. Cole, manager is taking bids for a factory building 83 x 220 ft., which it will erect at once.

Keppler and Weidelich of Providence, R. I. have moved their factory from Thurbers Ave., to 38 Friendship St. This firm make a very novel line of silver jewelry from silver coins. The figure in the center of the coin is brought out in strong relief, leaving the rest in the background. The wording of the coin is left undisturbed.

Stockholders of the Duplex Metals Company, Chester, Pa., manufacturers of copper clad wire products, will hold a meeting Sept. 10 to consider a proposed increase of $1,500,000 in preferred stock. The present capital is made up of $3,000,000 common and $500,000 preferred stock. It is the intention practically to double the size of the plant.

The Premier Aluminum Foundry Company, Cleveland, Ohio, has been incorporated with a capitalization of $10,000 to manufacture aluminum castings. The company, organized primarily to manufacture parts for the Premier Vacuum Cleaner Company, Cleveland, will also do outside work. R. E. Hyde, secretary of the vacuum cleaner company, will also be secretary of the foundry company.

The new plant of the Bridgeport Screw Company, Union Ave., Bridgeport, Conn., has been completed and is now in operation. W. H. Farrell is at the head of the company. The size of the factory is 70 x 300 ft. Both wood screws and machine screws will be manufactured by the company. Mr. Farrell was formerly managing director of the Dominion Wire Works of Montreal, Canada.

The Fairbanks Company, Binghamton, N. Y., valve manufacturers, has taken out permits for the erection of three buildings on its property on Glenwood avenue and Main street. There will be an iron foundry, a brass foundry and a melting room. All of the buildings are to be of brick and practically fire proof, and are estimated to cost $4,000. The machinery required, most of which has been purchased, covers all classes of foundry appliances.

The Duquesne Motor Car Company, Pittsburgh, has been organized by local interests and has taken over 60,000 sq. ft. of floor space in the building of the Pittsburgh Gage & Supply Company with combination switching rights over the Baltimore & Ohio and Pennsylvania railroads. W. L. Rodgers, president Pittsburgh Gage & Supply Company, is also president of the new concern and R. F. Ram[illegible] is treasurer. Frank H. Morse, the de[illegible] of the Russel Cars, is engineer, and Oscar J. Hewick, former designer of the Locomobile, is designer.

The Wellman Bronze Company, Cleveland, has increased its capital stock from $25,000 to $50,000.

The Moline Scale Company, East Moline, Ill., has awarded the contract for an addition to its plant 72 x 176 ft., of brick construction and to cost $50,000.

Cummings Manufacturing Company, Attleboro, Mass., which has been located at 45 Union street, has removed its business to 23½ County street, where they will have more room for transacting business. Jewelry is manufactured.

The Lewis Grease Cup Company, Camden, N. J., has been incorporated with a capital stock of $100,000. J. A. Lewis, Camden, N. J., is understood to be identified with this project, although details as to the company's plans regarding the erection of a plant are not available.

The Standard Engineering Works, Ellwood, City, Pa., has completed a new billet piercing machine for 3 to 6-in. brass and copper billets for the Chase Rolling Mill Company, Waterbury, Conn., and has ready for shipment four double chain draw benches for the same company for use in its new tube mill.

The American Vanadium Company, 332 Vanadium Building, Pittsburgh, supplier of pure vanadium, has drawn plans for a new plant at Bridgeville, Pa., which will treble the capacity of its present plant at that place. Bids will be asked for in a short time on the erection of the building and on a large amount of new equipment that is to be installed.

The Domestic Vacuum Cleaner Company, Worcester, Mass., has absorbed the Domestic Vacuum Sweeper Company, Peoria, Ill., and the Domestic Sales Company, and has increased its authorized capital stock to $250,000. The business is comparatively new, having been established but two years, in which time the working force has increased to 300 hands, producing about 500 vacuum sweepers daily.

The Bay City Copper & Brass Mfg. Company, Bay City, Mich., will have its plant in operation in about two months. Its product will be seamless copper and brass tubing from 1¼ in. down. Thomas W. Clements is president and traffic manager; G. S. Oliver, vice-president and general manager; D. I. Lister, secretary; P. J. Flower, treasurer; C. J. Perry, general superintendent; sales agency, 308 Sun Building, Detroit.

The Standard Welding Company of Cleveland, Ohio, are now making steel tubing from ¼ to 3 inches diameter and from 12 to 24 gauge. Owing to the peculiar method of manufacture, the surface is exceedingly bright and free from scratches. This tubing is now being used in the manufacture of motor-cycles, bicycles, bedsteads, sword-scabbards, exhaust tubes for automobiles, die-stock handles and a large number of other lines of work. The tubing is supplied in round, square, half-round, hexagon and many other shapes of a special kind.

The Mueller Mfg. Company, Decatur, Ill., is putting up a machine shop and brass foundry in Sarnia, Ont.

The Marvel Carbureter Company, Indianapolis, has entered into an agreement whereby it will move to Flint, Mich., where it has secured a building 50 x 150 ft., three stories.

The National Copper Refining Company, Cleveland, Ohio, has been incorporated with a capital stock of $250,000 by F. K. Rand, F. H. Rand, Julius Bloomberg, Eugene E. Wolk and Nathan Komito.

The Gray Telephone Pay Station Company, Hartford, Conn., will shortly begin the erection of its new factory on a site recently purchased on Arbor street. The building will be 50x200 ft., four stories.

The A. Storrs Bement & Co. of Boston, Mass., are placing on the market a "Non-Tarnish Tissue" paper for use in wrapping silver, gold, plated and other varieties of metal goods.

Fire recently burned out the brush factory of Elmer Meeker at 46 Green St., Newark, N. J. A line of platers', silversmiths' and manufacturing jewelers' brushes are manufactured. Operations have now been resumed in the factory adjoining.

George McAleer of Newark, N. J., manufacturing jeweler, has recently installed a system of suction apparatus at his factory to take care of the dust from his polishing and buffing lathes. A new line of collar buttons, cuff buttons, etc., in sterling silver and filled gold will also be made.

A fire recently did $3,000 worth of damage to the storage building of the American Oil and Supply Co., 46 Green St., Newark, N. J. The jewel department was only slightly damaged. This company manufacture and deal in a very extensive line of jewelers', silversmiths and metal workers supplies.

The Canadian Fairbanks-Morse Company, Ltd., Toronto, has completed arrangements for the issue of $1,000,000 additional preferred stock, of which $400,000 will go into plant enlargement, and the remainder will be available as working capital. Supplementary letters patent have been granted to the company to increase its capital to $3,100,000.

The Willys-Overland Company, Toledo, Ohio, which recently acquired the Garford automobile plant in Elyria, Ohio, will at once begin the erection of an addition to the Garford plant 60 x 300 ft. It is also stated that another four-story factory building will probably be erected in connection with the Garford plant within a year. Among other improvements to be made at this plant is the installation of an automatic sprinkler system.

Personal.

William Schneider of Brooklyn, N. Y., the well known electroplater has severed his connection with the Colonial Metal Works and is now associated with the Roessler & Haaslacher Chemical Co., 100 William St., New York City. Mr. Schneider has been foreman plater for the Colonial Metal Works for the past five years, and previous to this time was connected with a number of the largest manufacturers of metal goods in the United States.

George F. Comstock is now in charge of the new testing laboratory of the Titanium Alloys Co., Niagara Falls, N. Y. This laboratory was recently erected at a cost of $10,000. Mr. Comstock was formerly connected with the Park Works of the Crucible Steel Company of America of Pittsburgh, Pa., in the capacity of metallurgist metallographist.

J. Rogers Flannery has been appointed a member of the Pittsburgh Industrial Development Commission. He is actively identified with a number of Pittsburgh manufacturing interests, being president of the Vanadium Metals Company, president of J. Rogers Flannery & Co., president of the Pittsburgh Paper Box Company, and a director in the Flannery Bolt & Nut Company and the Vanadium Company of America. Recently he was elected a director of the First National Bank of Pittsbhrgh, and is connected with other financial concerns. He is a member of the board of the Pittsburgh Athletic Association.

Obituary.

Alfred W. Terrio, for the past seven years assistant manager and salesman for the E. Reed Burns Metal Polish & Supply Co., of Chicago, Ill., died on August 22nd. aged 37 years. Death was caused by an accidental gun-shot wound. Mr. Terrio was well known in the West and was held in high esteem in the trade. A wife and son survive him.

Frank J. Mulcahy, vice-president and general manager of the Crane Valve Company, Bridgeport, Conn., died August 19, aged 53 years. He was born in Cleveland, Ohio. In his early life he was a telegraph operator, and later a train dispatcher for the Pennsylvania Railroad, and then went to the Murphy Varnish Company, and later to the Deering Harvester Company as purchasing agent. Because of his success in this latter work he was made purchasing agent for the World's Columbian Exposition in 1891. At the close of the fair he became the purchasing agent of the Crane Valve Company, and in 1905 was promoted to the office of general manager.

William S. Lamson, Lowell, Mass., founder of the Lamson Store Service Company and of the Mason Safety Tread Company, died August 16, aged 66 years. Trained in the dry goods trade, he saw the opportunity for lessening labor in the handling of cash and invented the device upon which the Store Service Company was built. While abroad in 1895 he saw the safety tread, the manufacture of which he began. He was the president and general manager of this company at the time of his death. He served in the Civil War. He leaves a widow and two sons.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.24
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia, 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.08½
Arsenic, Metallic	lb.	.10
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.50
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitrol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.50
Chrome-Green	lb.	.17¾
Copper, Lake, (carload)	lb.	.18
Copper, Lake, (cask)	lb.	.17⅝
Copper, Electrolytic, (cask)	lb.	.17⅞
Copper, Electrolytic, (carload)	lb.	.17½
Copper, Casting, (carload)	lb.	.17¾
Copper, Casting, (cask)	lb.	.35
Copper Acetate (Verdigris)	lb.	.25
Copper Carbonate, dry	lb.	.09
Copper Sulphate (Blue-Stone)	lb.	
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Flour-Spar	lb.	.01¼
Fusel Oil	gal.	3.50
Gold Chloride	oz.	11.75
Gold, Pure	oz.	20.87
Gum Copal	lb.	.30
Gum Guaeum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iridium	oz.	62.50
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.05½
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	1.16
Mercury, Metallic (Quicksilver)	lb.	.42½
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.41
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Satpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Cloride	oz.	23.00
Platinum Metallic	oz.	45.50
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic	lb.	.05½
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.08
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.62½
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.48¼
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc, Carbonate, dry	lb.	.19
Zinc, Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.07½

THE BRASS WORLD AND PLATERS' GUIDE

VOL. VIII. BRIDGEPORT, CONN., OCTOBER, 1912. No. 10.

A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.

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Contents for October.

Aluminum Prices Abroad 357
Anode Hook, New Form of 367
Antimonial-Lead, Electroplating 344
Amyl Acetate and How it is Made 350
Brass and Bronze Plating Solutions and How to Make them 352
Brass Melting Furnaces, Testing Merits of 343
Boron Suboxide, Price of 364
Copper by Boron Suboxide, Casting 355
Copper Refining, Improvement in 371
Crucible Furnaces, Improvement in Coke 371
Electric Furnace for Brass Melting 357
French-Gray Work, Black Nickel for 353
Gas Fixtures and Fittings, Defects in 368
Glass, New Method of Electroplating 366
Gold Deposit by Nickel, Brightening 364
Magnesium for Use in Casting Silicon 363
Melting Furnaces, Testing Brass 343
Melting Points of Metals, Accurate 354
Mercury as Cause of Season Cracking of Brass 345
Nickel for Brightening Gold Deposits 364
Nickel for French Gray Work, Blacs 353
Patent Abstracts 374
Questions and Answers 372
Rockwell Underfired Annealing Furnace 365
Rubber to Metals, Attaching 349
Sand Blast Tumbling Barrel, The "Paxson Warren" 369
Season Cracking of Brass by Mercury 345
Silicon by Magnesium, Casting 363
Silver Deposit Work, Blistering 364
Silver, Ornamenting Metals with 370
Silver, Testing Glue, Paper and Cloth for Effect on 351
Soft Metals, Electroplating 344
Trade Items 376

Testing the Relative Merits of Brass Furnaces by the Government.

The recently formed Bureau of Mines, of which Dr. Joseph A. Holmes is the very efficient and capable director, proposes to carry out an elaborate series of tests upon brass melting furnaces with the object of determining which is the most efficient, and with the ultimate view of preventing the loss of zinc which daily takes place in every brass foundry and brass rolling mill in which brass is melted. In this investigation the co-operation of the American Institute of Metals has been obtained and at the meeting of the Institute, held in Buffalo on Sept. 24-27th, Charles L. Parsons of the Bureau of Mines, delivered an address upon the subject which proved of the greatest interest and provoked much discussion.

It seems to us, however, that the subject of investigation is ill chosen. The furnace problem of to-day is not one of efficiency but one of local conditions. Oil is used in many instances where, were coke cheaper, it would be employed. Paradoxically, oil would be likewise employed in some localities where coke is now used on account of its lower cost. In the Naugatuck Valley of Connecticut, where most of the brass rolling mills are situated, hard, anthracite coal is used for melting for the reason that the manner of melting and "holding the heats" demand it. Coke is difficult to use.

Crucibles are now almost universally used except in the case of very large castings where it is difficult to melt such a large amount of

metal in them. The former types of tilting furnaces using no crucibles are rapidly passing out of existence and the largest concern making them has just gone into bankruptcy.

Foundries making small castings have different conditions than those making large ones, and the whole problem seems to resolve itself into one of locality and local conditions. Were a conclusion reached, it would suit only certain brass manufacturers and be of no value to others.

The results of the investigation, too, would be associated with some advertising features, (in which, of course, the Bureau of Mines is not interested) in fact, no matter how carefully the identity of the maker of the furnace or the type of furnace might be concealed, some data, drawings or information must be given out although, a maker's name might be withheld. It would then be a simple matter to fit the results of the investigation to one particular maker of a furnace and the whole would then be condensed into commercialism.

It appears that this investigation is one of a plan mapped out by Dr. Holmes for saving the enormous losses which are now going on in this country in the mining and metallurgical industries. It is part of the chain, and to us seems the weakest link. We believe that the loss of zinc in the brass industry has been overrated. In the aforesaid address made by Charles L. Parsons at the Buffalo meeting of the American Institute of Metals, he made the statement that he had visited Waterbury, Conn., the seat of the brass rolling mill industry and had estimated that the loss of zinc in this city from the melting of brass is about 700 lbs. per day which seems to us a comparatively insignificient item compared with the fact that, according to Dr. Holmes in mining 500,000,000 tons of coal in the past year, 250,000,000 tons were wasted.

We believe there are so many other problems that could be worked out by the Bureau of Mines which would be of untold benefit that the furnace investigation should be left untouched. If it is investigated, we cannot help feeling that the results will be of questionable value.

Note on Electroplating Antimonial-Lead.

The extensive use of antimonial-lead for making soft metal novelties of all kinds, has been instrumental in calling for a more expert knowledge of the art of electroplating than has heretofore existed. A plater who can turn out soft metal novelties with modern finishes so that the trade will find no fault with them can really consider himself at the front of his profession. It is believed that, taking it day in and day out, antimonial-lead is the most difficult material to electroplate that is used in the trade. It cannot be bright dipped like other metals. Neither can it be pickled to remove any oxide. It tarnishes and corrodes readily and the only method of removing these surface difficulties is by scouring.

Practically every manufacturer of soft metal novelties makes his own castings. The antimonial-lead consists of lead and antimony in the proportion of about 87% of lead and 13% of antimony. The metal is melted in an iron kettle and poured into bronze molds by means of a hand ladle. When the metal has "set", the mold is opened and the casting removed, when the mold is ready for casting again.

The casting thus made is bright and clean, and could it be immediately electroplated without handling, no cleaning at all would be necessary. It is impossible, however, to electroplate the castings as soon as they are cast, and they must also be handled to cut the gate off and to transport from one portion of the shop to another. This results in the castings becoming greasy so that cleaning is necessary.

The castings, however, do not tarnish or corrode very rapidly and the grease is readily removed by the usual cleaning solutions. If, however, the castings are left for some time, particularly if in a damp atmosphere, they will corrode and then scouring with water and fine pumice must be carried out. A slow and costly operation in many instances.

It is, therefore, essential that antimonial-lead castings be electroplated as soon as possible after casting; and at the same time unnecessary handling should be avoided. The sooner the castings are electroplated after casting, the less the labor and the better the results will be.

The Season-Cracking of Brass and Other Non-Ferrous Metals and Alloys, as Caused by Mercury.

By Erwin S. Sperry.

Without question, the season-cracking of brass is the most exasperating of any of the difficulties to which it is subject. It is exasperating for the reason that it rarely occurs while the brass is in the mill of the manufacturer who makes it. Indeed, it may be said that season-cracking takes place so seldom in his mill that when it actually does occur, on extremely rare occasions, it is worthy of note. Many of the workmen in a brass rolling mill making sheet, rod, wire or tubing have never seen a case of season-cracking, except, perhaps that which may have been noticed on scrap returned. They are familiar with fire-cracks, but season-cracking is a new phenomenon to them.

It is the customer of the brass rolling mill who has the difficulty and it is for this very reason that it is so annoying when it does occur. It may happen several years after the brass has been purchased and goods have been made up. It may season-crack after made up into various articles and sent broadcast over the country to the consumer. If the article thus made of brass is cheap, nothing is said about it, but if expensive goods are made up, then the customer brings the matter before the manufacturer of the goods

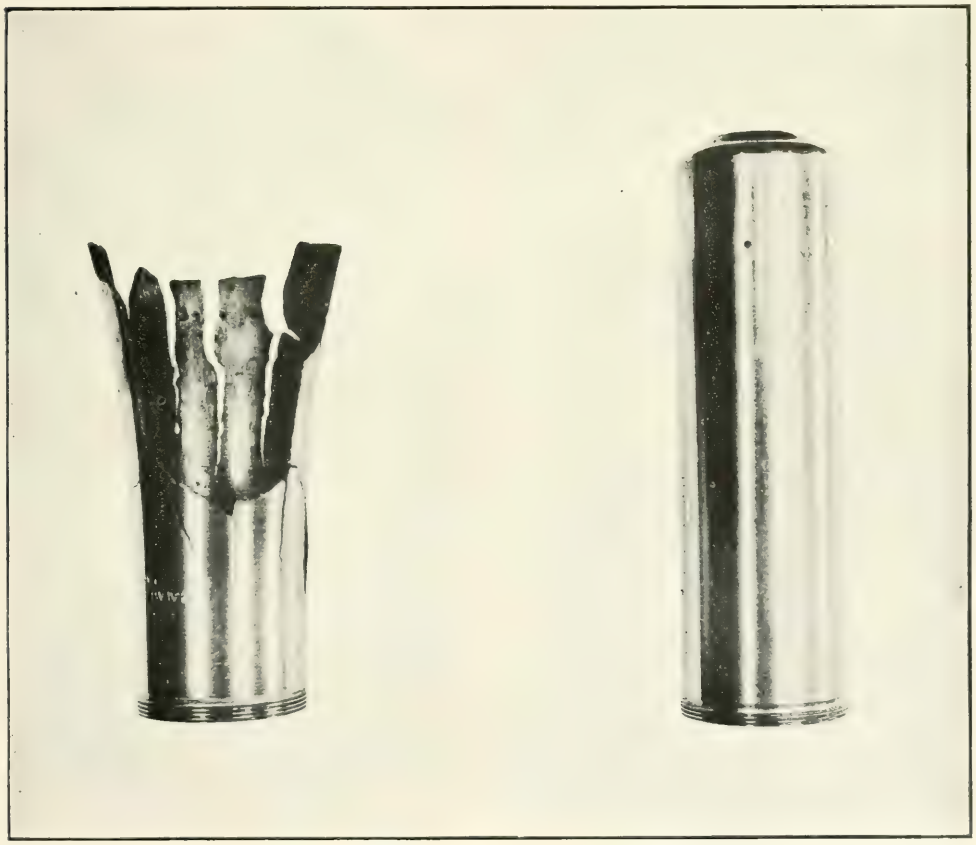


Fig. 1. Brass Shell Cracked by Mercury. The Shell Was Used to Hold Mercurial Ointment. The Shell at the Right Hand Shows the Original Condition of the Cracked Shell.

who, in turn, considers that the brass is at fault and comes back at the brass rolling mill with some pointed remarks about the quality of his metal.

When goods season-crack in such a manner, it is an extremely difficult matter to convince the manufacturer who made them from sheet or other form of brass, that the brass is not to blame. There are, of course, occasions

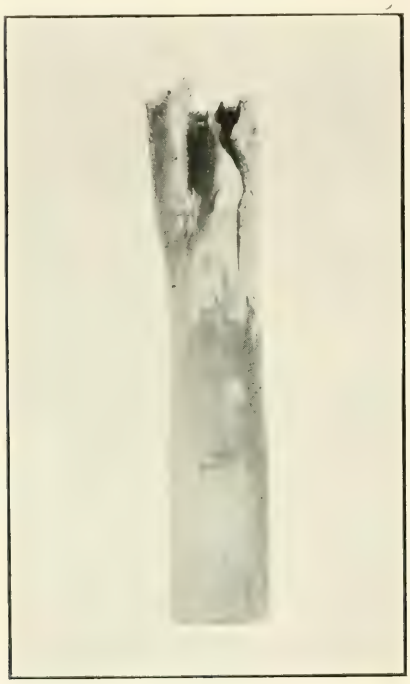


Fig. 2. Seamless High-Brass Tube Cracked by Presence of Film of Mercury.

when it may be, if tubing is used as it is possible, by uneven drawing to produce internal strains which *may* result in season-cracking. Sheet metal is not subject to it and wire cracks when made into springs, fatigued and subjected to repeated vibration. While analagous to season-cracking, and perhaps is identical with it, this phenomenon is called "crystallization" and, possibly, season-cracking is the same thing. The cause may be different, however, but the effect seems to be almost identical.

The manufacturer who purchases sheet brass from a reputable rolling mill, makes it into wares and when these have been made and have been in stock for some tine, finds that they have cracked badly is quite apt to blame the manufacturer of the sheet brass. He knows that the goods were all right when they were finished, and when packed in boxes and put on his shelves in the store room were likewise perfect, so that when, after, perhaps a number of months, he finds that the goods are cracked (possibly every one of them) he naturally believes that the fault lies with the maker of the sheet brass.

From the time brass sheet began to be made this difficulty has occured, and the manufacturer has, it is believed, been unduly censured and in many instances subjected to treatment not due him. Rather than have any controversy, "broad gauge" manufacturers have been known to take back such season-cracked brass and pay for the labor put upon

Fig. 3. Brazed Brass Tube Cracked by Coating With a Light Film of Mercury and Then Compressing.

it. This, however, was in the past, when little was known of the cause of season-cracking, and the brass rolling mill proprietor was somewhat dubious about the real cause of the cracks. He faintly imagined that there was a remote possibility of the difficulty actually being caused by imperfect treatment of the brass at his rolling mill, so he granted the

demands of his customer and allowed his claim. As a question of policy, this may have been all right, but to-day the matter is different. When the user of the brass sheet serve to explain some of the perplexing instances of cracking that occur on silver plated goods.

Before entering into the details of the

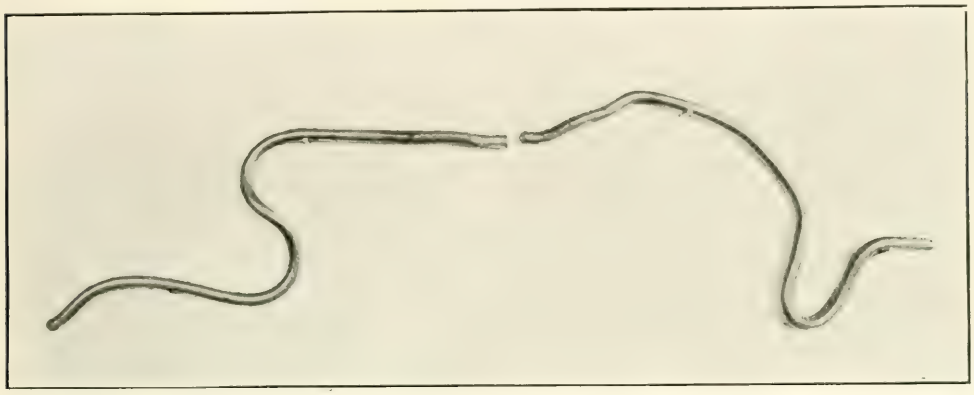


Fig. 4. 10% German-Silver Wire, Cracked by Slight Film of Mercury.

finds that his goods are season-cracked and the rolling mill can give him no reason for it, it is not surprising that he should firmly believe that the fault lies with the sheet brass; but when it is possible to get to him and say:

"Your difficulty is in the shape of your dies, or in the way the goods are annealed, or in the fact that you are using mercury in preparing the goods for electroplating;" then it is possible to demonstrate to him that he and not the brass itself is the cause.

Such is the state of the art to-day and the greater our knowledge of the cause of such a phenomenon as season-cracking, the more manufacturing becomes simplified. It serves to close the gap that has always existed between the rolling mill and the manufacturer who cuts up the brass and makes it into articles for the trade.

The excuse for writing this article is the fact that little has been known about season-cracking being caused by mercury. To be sure it has been known for some time among certain of the brass rolling mills, but as general knowledge it has not existed. As far as known, the fact that mercury will bring about season-cracking has never before been published, and it is believed to be a more frequent source of season-cracking than is imagined. Mercury is extensively used in electroplating. More particularly in silver plating, perhaps, and it will readily be appreciated that a large amount of it is done. It is hoped, therefore, that this article may phenomenon, let me explain what season-cracking is:

What Season-Cracking Is

Season-cracks are those which occur in brass or other metals when the article, upon which they occur, is not in use or, in other

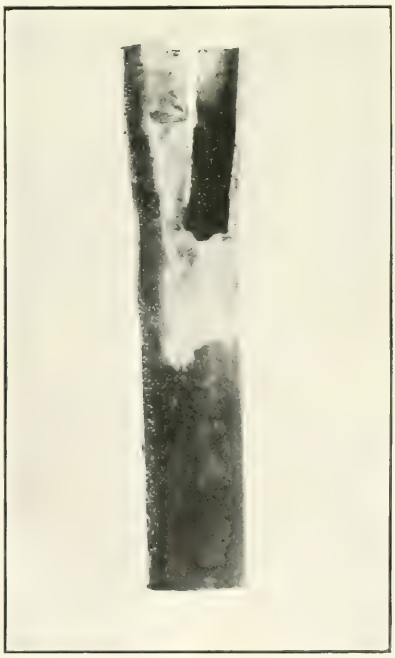


Fig. 5. Phosphor-Bronze Seamless Tubing Cracked in Same Manner as Fig. 2.

words, is at rest. If in motion, the phenomenon is called "crystallization" and there seems to be a very close connection between the two. By referring to the left hand casting of Fig. 1 a bad case of season-cracking may be seen. It will be noticed that the cracks are all irregular. It does not necessarily follow, however, that the cracks are so numerous as in this example, as frequently one small crack is all that makes its appearance. The cracks may make their appearance soon after the goods have been made, or they may occur long afterwards.

Ordinary season-cracking may be caused by internal strains in the goods. For example, a seamless brass tube that has been compressed, while being drawn through the die on a drawbench more on the outside than on the inside, and particularly if the brass has been drawn very hard so as to almost fatigue the metal will often crack on standing. The same is true of brass sheet after being drawn in a press in which the die and punch are so made that the metal is not stretched at all but simply formed into shape. This puts strains in the metal. Another cause is the action of various chemicals such as ammonia or its compounds.

Season-cracking, therefore, may be defined as that which takes place without any apparent outside influence and *per se*. It is supposed to occur spontaneously.

Ordinary season-cracking occurs in yellow brass, although German-silver and other alloys containing zinc are subject to it. The red metals are not apt to crack, although now and then instances are known where they have done so. Even copper has been known to develop the difficulty. With mercury, as will subsequently be explained, the season-cracking may take place with all the non-ferrous metals.

Season Cracking Caused by Mercury

One may naturally ask the question, From what source does the mercury come? Is it in the brass, or used in its manufacture? In reply it may be said that it comes from two sources:

1. From mercury salts used in a solution for preparing brass or other non-ferrous metals for silver or gold plating. This solution is known as a "quick dip" or a "blue dip". It contains some salt of mercury in solution. The brass or other metal is dipped into it and becomes coated with a film of mercury. The longer it is allowed to remain in the solution, the more mercury will adhere to the surface. The article is then silver plated. The mercury serves to bind the silver to the base metal and it is customary and has been for many years to use such a solution in silver plating. It prevents the silver from peeling while the articles are in use, and while it is possible to silver plate without it, it is considered standard practice and the safest to use the mercury dip previous to depositing the silver.

2. From mercury compounds, such as ointments, pastes containing mercury salts as a preservative and other chemicals containing mercury that may come in contact with the brass or other non-ferrous metal in some way or another. The season-cracking of the brass shell in Fig. 1 was caused by an ointment containing mercury.

Fig. 6. Ordinary, Hard-Rolled 2 and 1 Sheet Brass Cracked by Mercury Film.

It has been known for some time that mercury would cause the season-cracking of brass, but whether it would have a similar effect on other non-ferrous metals was uncertain. It was deemed advisable, therefore, to make some experiments in order to ascertain whether the effect was similar to that of brass. It was found that all the non-ferrous alloys are affected in a similar manner.

Before describing the results of the experiments, the cause of the season cracking shown

in Fig. 1 will be given. The article was a brass shell, about one inch in diameter and drawn from thick, sheet brass. One end was nearly closed, except for a small hole, the other end was left open as indicated in the right hand figure. This right hand figure was an article that had not been used and had not seasoned-cracked. The other had been used and had season-cracked to a very bad extent as indicated.

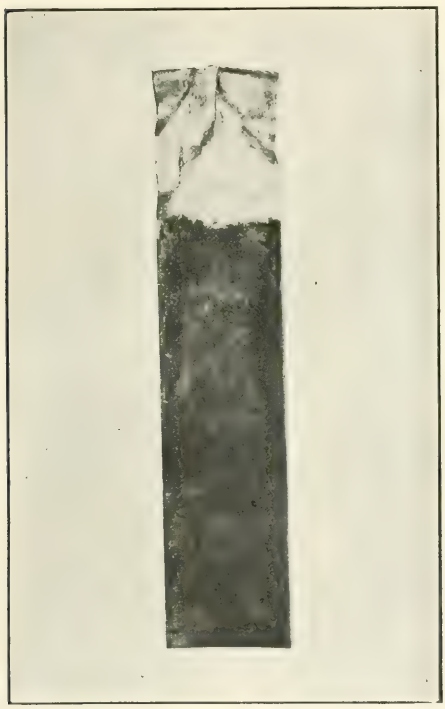


Fig. 7. Soft, Sheet Copper Cracked in Same Manner as Fig. 6.

The article was used for holding mercurial ointment and was made for veterinary surgeons. When completed it had the form of a syringe. When used to contain the ointment, the season-cracking took place. The peculiar shape of the cracked article was caused by a strain on the outside of the shell, produced in drawing it up, which caused the metal to spring out when the cracking took place.

To test the effect of mercury on the various non-ferrous alloys, samples of various shapes were taken and coated with a slight film of mercury and then allowed to stand. It was found that the mercury did not penetrate the metal immediately, but after a few hours the effect was noticeable. A longer time produced a greater penetration. After having remained for several hours, the article was bent slightly when the cracking took place.

In Fig. 2 a seamless brass tube, made of high brass, was tested. When squeezed slightly in a vise, the cracking took place as shown. The tube was hard-drawn.

In Fig. 3 is illustrated a brazed brass tube of low brass. This tube was annealed before treating and when bent or flattened the cracking took place. It is apparent that the effect of the mercury is more manifest on hard drawn brass than upon soft metal.

In Fig. 4 is a No. 8 B. & S. gauge German-silver wire. It contained 10 per-cent of nickel. When slightly bent after treating with mercury, the fracture took place as shown. The wire was soft and the effect of the mercury was quite marked.

In Fig. 5 a piece of seamless phosphor-bronze tubing containing 98 per-cent of copper, 2 per-cent of tin and a small amount of phosphorus (about 0.05 per-cent). This behaved like the others.

Hard rolled high brass sheet, shown in Fig. 6, cracked similarly to the others after treatment with the mercury.

In Fig. 7 soft, sheet copper is shown. This cracked after standing for some time, but unless given from 5 to 24 hours the metal did not appear to be affected appreciably.

One thing was apparent from the experiments that hard rolled brass is more readily cracked by brass than soft material.

Attaching Rubber to Metals.

A method of attaching rubber to metals has been patented by Leo Daft of Rutherford, N. J., and which is quite simple. The metal to be attached is electroplated in a solution containing copper, zinc and antimony. These metals are in proportion of 60% of copper, 38% of zinc and 2% of antimony. The plating solution is made by dissolving such an alloy in nitric acid, precipitating with sodium carbonate and then dissolving in cyanide. The anode is of the above mixture of metals.

The metal to which the rubber is to be attached is electroplated with the alloy previously mentioned, the rubber attached to it and the whole vulcanized. The rubber then becomes permanently attached to the metal. The antimony is used to assist the vulcanization.

Amyl Acetate and How It is Made.

Large quantities of amyl acetate are used in the manufacture of pyroxylin (gun-cotton) lacquers and every one who has been connected or identified with a concern manufacturing metal goods is familiar with its pleasant odor.

As a solvent for pyroxylin, amyl acetate is unique in that out of a large number of such solvents, it is practically the only one that is not miscible with water. It will not mix with water and is, therefore, a water repellent. This fact may appear somewhat insignificant to the ordinary reader, but it is an extremely valuable property for it has made possible the so called cold process lacquers which can be used in damp weather without ill effects upon the work. Many of the older platers well remember that with the old fashioned spirit lacquers, made by dissolving shellac or other resins in alcohol, the work to be lacquered must be heated and the room kept dry. If this was not done, the alcohol would absorb moisture and the shellac would become precipitated and the lacquer turn white. With the pyroxylin lacquers containing amyl-acetate as the solvent this will not occur. It is not making too broad a statement, it is believed, when it is said that the lacquer industry of to-day owes nearly as much to amyl acetate as it does to the pyroxylin itself.

The use of amyl acetate as a solvent for pyroxylin (gun-cotton or nitro-cellulose) was patented in 1882 by John H. Stevens and the patent was owned by the Celluloid Company of Newark, N. J. The patent has, therefore, elapsed. It is estimated that the United States yearly consumes over 450,000 gallons of amyl acetate and the quantity used is constantly increasing. Amyl-acetate is made from fusel oil and it will readily be appreciated that its price depends upon the price of this latter material. Fusel-oil is a by-product in the manufacture of alcohol and that consumed in the United States is nearly all imported; at least that used in the lacquer industry. The method of making it is as follows:

A certain quantity of fusel-oil is mixed with a given amount of strong sulphuric acid and allowed to stand about 24 hours. This mixture is then put into a still with acetate of lime and well agitated mechanically. The whole is distilled by means of steam heat and the amyl-acetate distills over and is condensed in a suitable condensing apparatus. The amyl-acetate thus obtained is crude and contains water and other substances. The water is removed by calcium chloride and after other treatment, the water-free material is subjected to fractional distillation when a pure product is obtained.

There are two kinds of amyl acetate upon the market: One is very pure and is used for flavoring syrups, soft drinks and essences. The other is used in the lacquer and celluloid industry.

Pure amyl acetate is colorless and has the odor of various kinds of fruit, depending upon its degree of purity. Ordinary amyl acetate of commerce has an odor not unlike that of bananas. If very pure it has a pear odor. When mixed with alcohol or other organic materials, such as some of the esters, other fruit odors are produced.

Amyl acetate has a specific gravity of 0.8837 and is, therefore, lighter than water. The boiling point is 139° C. (282° F.). The flash point is 22° C. (70°F.)

The price of amyl acetate has steadily risen within the past few years until it has now reached a price that seems almost prohibitive. This has caused the use, to a greater extent than heretofore, of various substitutes such as acetone (a water absorbent), benzine, and alcohol. The fact that amyl acetate is such an excellent solvent, and at the same time does not absorb water, leaves it in a class by itself and it has no peer.

The Queen of Spain possesses a telephone set of solid silver, with a gold transmitter, supported by four bronze figures, between which a boy leaning against a Spanish coat-of-arms is conversing by telephone (a golden wire) with an English girl in close proximity to a British lion. The apparatus stands on her Majesty's writing table and connects only with the Royal nursery.

The trade in brass-covered iron pipe used extensively in Mexico for manufacturing iron bedsteads is supplied exclusively by English manufacturers. Large shipments—25 to 30 tons—are frequently received through this port, the total reaching about 150 tons a year. The pipe is well wrapped in straw ropes, then covered with strong burlap well sewed. It arrives in first-class condition. The outside diameter of this pipe is [illegible] inch, with a covering shell of brass.

Testing Paper, Glue and Cloth for Their Properties of Tarnishing Silverware.

Silver plated goods, after they have been finished, are wrapped in tissue paper, and unless very large, are usually placed in boxes. These boxes are of paper, and for special goods, may be lined with cloth so that the flatware or hollow-ware can be displayed in them. At any rate, the silver-ware is more or less subjected to the influences of the paper, cloth or glue of which the boxes are composed or with which the silver is in contact.

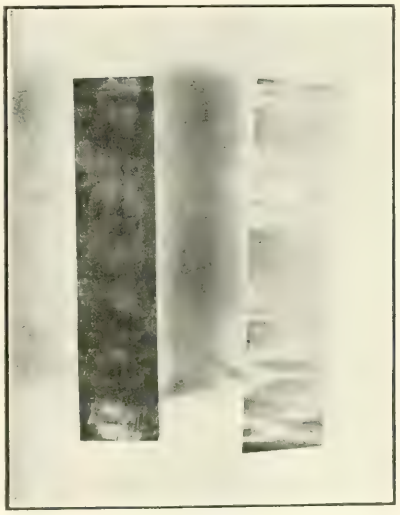
Manufacturers of silver-ware are frequently annoyed, especially during the damp and hot summer months, by the tarnishing of silver goods while in stock. When this is the case, it is usually believed to be the materials of which the boxes are composed or the paper in which the goods are wrapped. Manufacturers have found that the tissue in which the silver goods are wrapped is the most common source of difficulty in the way of tarnishing as the tissue is actually in contact with the silver and under such a condition tarnishing will take place rapidly if the paper possesses tarnishing properties. It has been found that, even though the tissue in which the silver is wrapped will not tarnish the silver, tarnishing may take place and frequently does. It is then assumed that the paper, cloth or glue of which the boxes are made are instrumental in causing the tarnishing.

Under such considerations as those previously mentioned, it becomes necessary to test the paper, cloth, or glue composing the boxes and the tissue paper in which the silver goods are wrapped. The testing is exceedingly simple and does not require any chemical knowledge or experience.

Tarnishing of silver is almost invariably caused by sulphur or sulphur compounds. Rarely is it caused by any other substance although under some conditions chlorine, or other corrosive substances may cause it. Sulphur, however, is the principal cause. In the method of testing about to be given, it matters not what the substances are that tarnish the silver, the test is conclusive. It does not, however, indicate what the tarnishing material is, and the manufacturer is not interested in this point. All he wants to know is whether the goods of which the boxes are composed, or the paper in which the silver is wrapped is capable of tarnishing silver. As previously mentioned, however, it will be found that sulphur compounds are almost invariably the cause.

Many mistakes have been made in testing the aforesaid materials for their properties of tarnishing silver and inexperienced or young chemists are quite apt to make too difficult work of it and carry the art of chemical analysis very much too far. The fact that a test for sulphates is obtained does not indicate anything. Sulphates are inert and have no harmful influence on the tarnishing of the silver. It is the sulphides that are injurious.

The best methods of testing materials are always those in which as near the conditions obtained in actual practice are realized. For this reason, the method of testing the goods to find their influence on the tarnishing of silver should be as nearly like that used when the goods are stored. Exact conditions, however, are difficult to obtain and as nearly similar ones as circumstances will permit should be used. The following is the method that has been found best for testing these materials



Sheet Silver, Showing Appearance After the Test. The Dark Sheet Indicates Sulphur in the Material Tested. The Dark Portions on the Other Sheet are Light Reflections.

Method of Testing

If the material is paper, place in a clean glass or porcelain vessel of fairly good size, such as a glass beaker holding a pint, a porcelain casserole, or an ordinary china bowl. Fill about half full of *distilled water* and stir

up the paper in it until a pulp has been obtained. A clean silver spoon is suitable but the best is a glass rod. Now place a strip of silver sheet, either fine silver or sterling-silver, in the pulp and now and then stir it up. Allow to stand about 24 hours and note the condition of the silver. If tarnished, the paper contains sulphur compounds that will tarnish silver. One thing should be noted. The silver in sheet form should be clean and free from grease, otherwise the film of this substance on the surface will prevent the sulphur from acting on the silver itself. The silver is preferably in the form of a strip about half an inch in width. Scour it bright with fine pumice stone and water and keep the fingers from it after it has been done.

Glue is dissolved in the water in the same manner, and cloth is cut into bits and made into a pulp with distilled water. Ordinary water should not be used as it may contain sulphur compounds. Clean spring water will answer, however, but distilled water is the safest.

If the silver remains white after being immersed in the pulp emulsion for 24 hours, then it can safely be assumed that the glue, paper or cloth contain no substances which will tarnish silver. If, however, the silver is badly tarnished, as it frequently is, then the material is quite unsafe.

It will readily be appreciated that if, under these conditions, silver is not tarnished, it will not be affected while in stock and wrapped and boxed. The conditions for the tarnishing of the silver in the actual testing of it are certainly far more favorable than in practice as a large quantity is soaked out in water and even a very small quantity of sulphur would be indicated on the silver. It may be of interest to know that the majority of glue, paper and cloth used in the manufacture of boxes for holding silver-ware and the majority of tissue paper will show no sulphur when tested in the previous manner.

Pickle tanks should be lined with sheet lead and the joints burned together by the process of "lead-burning." Soldered joints soon become attacked by the acid and quickly leak.

Brass anodes used in brass plating should be frequently cleaned. If allowed to coat over, the current is impeded and the brass deposit is apt to change in color, or have several colors.

Brass and Bronze Plating Solutions and How to Make Them.

Ninth Paper.

Use of Hot and Cold Solutions.

There appears to be somewhat of a misunderstanding in certain portions of the plating trade about the actual meaning of a hot solution. It is a very common thing to say, "run your solution hot". It is, however, unscientific and may mean a considerable range of temperature. When it is stated, many platers believe that it means a solution nearly boiling when this is far from being true. To run a plating solution near the boiling point is not only unsafe, if the solution is made up of cyanide, but means rapid evaporation and action on the tanks if they are wood. Neither is it advisable to use a solution at this heat, nor is it at all necessary. Nothing is to be gained by it and much is lost.

When a hot plating solution is used and when such is stated in plating directions, it is usually meant to refer to rather a warm solution. The usual temperature for a hot cyanide plating solution is from 120 to 150 degrees Fahrenheit. Beyond this there is too rapid evaporation and it is difficult to maintain a uniform temperature; but at 120° to 150° F. the evaporation is not rapid and most of the advantages of a higher temperature, with none of its disadvantages are obtained.

The advantages of a "hot" solution of brass or bronze, that is when used from 120° to 150° F. is that the conductivity of the solution for electricity is increased, the deposit is brighter and cleaner, the work being plated is covered more rapidly and uniformly, and the metal deposits more quickly. The anodes, too, remain clean longer, as the slime or coating that may form on them is more soluble in hot than cold cyanide solution.

The disadvantages of a "hot" brass or bronze solution are that the evaporation is greater than in a cold bath. This, however, is quite insignificant as it requires only the addition of water to bring it back to its orignal condtion. The other dfficulties are the action on the tanks which, of course, does not exist if iron tanks are used. In addition, the necessity of heating is more of an annoyance than a disadvantage. These reasons, therefore, cannot be considered serious.

The best method of heating a brass or bronze plating solution is to run a steam coil of iron pipe in the bottom of the tank. In this manner it is possible to heat the solution without introducing live steam. In case this cannot be used, then live steam can be employed.

A thermometer can be used to test the solution, but a plater soon becomes accustomed to the temperature by the feeling and as only an approximate temperature is required, it does very well. It will be found, however, that if a uniform and even temperature be maintained, the color of the deposit and the evenness will be easier to control. In this manner, too high a heat is avoided and there is no danger of having it too low.

A cold brass solution can be used to a good advantage and probably the majority of brass solutions are run cold. In winter, however, the temperature should not be allowed to fall too low over night. Much difficulty is caused by attempting to use a plating solution of any kind when its temperature is too low. The deposit forms slowly and is thin. This condition is found when a plating room is insufficiently heated, and especially on a Monday morning when there has been time for the solution to cool over Sunday. Plating rooms should, by all means, be warmed, and the temperature of a brass solution should not be allowed to fall much below 70° F. Uniform results, both summer and winter can then be obtained.

The use of a steam coil or pipe in a brass solution is strongly advocated, even if it is not desired to run a hot bath. It enables a plater to warm his solutions in winter and thus avoid difficulties produced by the use of a solution that has become too cold.

Gun-cotton used in making lacquers is made as follows: Ordinary cotton is first treated with caustic potash to remove the grease, after which it is washed and then treated with a mixture of nitric and sulphuric acids. This changes the cotton into a soluble condition and which is known as gun-cotton, nitro-cellulose or pyroxylin. For use in making lacquers the acid must be completely washed out. The cotton is then dried in a centrifugal machine.

Black Nickel for French Gray Work.

Ordinary black nickel, as used for producing a black deposit on work, is too hard for the French-gray finish as it is too hard to relieve. In order to be able to relieve it satisfactorily a soft deposit must be used. The following formula gives a soft deposit that may be relieved easily and is suitable for all classes of French-gray work on silver.

Flat-Ware Indicating Use of Black-Nickel for French-Gray Work.

To make it proceed as follows: Take 1 gallon of water and dissolve in it all the sal-soda (carbonate of soda) it will take up. In other words, make a saturated solution.

Take 1 pint of ammonia water and dissolve in it a mixture of 10 parts of carbonate of nickel and 1 part of carbonate of copper. Just how much of this will be dissolved cannot be given as it will depend upon the strength of the ammonia. Ammonia, as well known, becomes weaker upon standing so that it is preferable to make in this manner. To do it properly mix 5 oz. of carbonate of nickel and

½ oz. of carbonate of copper thoroughly and then add, little by little to the 1 pint of ammonia until no more will be dissolved. In other words, a saturated solution is obtained.

Now add the ammonia solution to the sal-soda solution and the bath is ready.

Use iron or steel anodes and the solution cold. A very black deposit is obtained that is permanent and is free from the fugitive nature of black nickel solutions containing arsenic. The current strength used is about that employed in nickel plating.

Accurate Melting Points of Metals and Non-Metals.

The following table of melting points is from Circular No. 35, June 15, 1912, issued by the Bureau of Standards of Washington, D. C. The table has been compiled by them and it is believed to be the most accurate published up to this time.

Element	*°Fahrenheit*	*°Centigrade*
Caesium	79	26
Gallium	86	30
Rubidium	100	38
*Phosphorus	111.4	44
Potassium	144	62.3
Sodium	207.5	97.5
Iodine	236.5	113.5
Sulphur	235	112.8
Indium	311	155
Selenium	422	217
Tin	449.4	231.9
Bismuth	520	271
Thallium	576	302
Cadmium	609.6	320.9
Lead	621.1	327.4
Zinc	786.9	419.4
Tellurium	846	452
Antimony	1166	630
Cerium	1184	640
Magnesium	1204	651
Aluminum	1217.7	658.7
Calcium	1490	810
Lanthanum	1490	810
*Strontium	?	?
Neodymium	1544	840
Arsenic	1560	850
Barium	1560	850
Praesodymium	1725	940
Germanium	1756	958
Silver	1761	960.5
Radium	?	?
Gold	1945.5	1063
Copper	1981.5	1083
Manganese	2237	1225
Yttrium	?	?
Samarium	2370	1300
Scandium	?	?
Silicon	2588	1420
Nickel	2646	1452
Cobalt	2714	1490
Chromium	2750	1510
Iron	2768	1520
Palladium	2820	1540
Zirconium	3100	1700
Thorium	3090	1700
Platinum	3101	1755
Beryllium	3270	1800
Ytterbium	?	?
Titanium	3450	1900
Rhodium	3525	1940
Ruthenium	3550	1950
Columbium (Niobium)	4000	2200
Boron	4000	2200
Iridium	4170	2300
Uranium	?	?
Molybdenum	4500	2500
Osmium	4900	2700
Tantalum	5160	2850
Tungsten	5430	3000
Carbon	6500	3600

*Yellow Phosphorus.

*The melting point is between calcium and barium or approximately 1500° F.

The elements marked with the interrogation point have a melting point between the ones on each side of them, but it has not been accurately determined. In the case of some of the rare elements, the melting points are open to doubt on account of the difficulty of obtaining pure metal.

Birmingham, by the variety of its industries, probably uses more copper for manufacturing purposes than any other city in the United Kingdom. There is a large and increasing consumption of copper, however, in London, owing to the electrification of railways. Of the total imports of unwrought copper into the United Kingdom in the last three or four years only about one-third was imported into London, but most of the reexports were shipped from this district.

Progress of Work on Boronized Copper.*

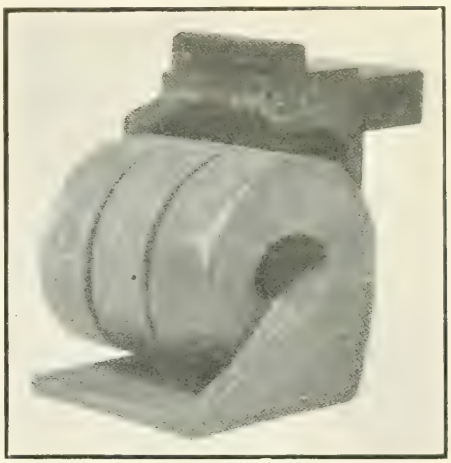
By Dr. E. Weintraub.†

(A short time ago, Dr. Weintraub discovered the fact that boron or some of its compounds may be used with great advantage in the deoxidizing copper and the production of sound copper sand castings. The process has been patented by him. At the Buffalo meeting of the American Institute of Metals, recently held, the following paper was presented by him and the history, advantage and method of using the boron or its compounds are described:—*Editor.)*

The process of boronizing copper was merely the result of a lucky idea which forced itself upon me through experimentation in a totally different line, namely, that of preparing the element boron in a pure state, a line of work which was begun primarily for the purpose of testing whether boron would be an appropriate substance for incandescent lamps.

The story is very short. After having isolated the element boron I was struck by the great affinity displayed by it toward practically every known element, whether metalloid or metal, but I was no less impressed by the apparent lack of affinity between boron and copper even at the melting point of the latter. I was carrying out the deposition of boron from boron chloride and hydrogen between water-cooled copper electrodes. Boron would deposit and grow on copper electrodes but the latter would not combine with the boron and any copper mechanically adhering to the boron could be easily washed off with dilute acids.

I had often heard that it was difficult to produce cast copper mechanically sound and of high electrical conductivity and how the accomplishing of this would be desirable for electrical and other work. I said to myself that since boron has such a high affinity for oxygen, nitrogen, and oxygen-containing gases, which were probably, in one way or another, the cause of the difficulties in copper casting and as boron on the other hand apparently had no affinity for copper it was very probable that boron would be the natural deoxidizer for copper. I thought it might be worth while trying this out but so many things look good in theory and yet do not work out in practice and it is so hard to tell beforehand which one of a number of good ideas will work and which will be a sore disappointment that under the pressure of other work I let this idea linger in my mind a number of months before I actually tried it and then one day when there was, luckily, a lull in other work, I asked my assistant, Mr. Kroner, to try to add a small percentage of amorphous



Copper Casting Made by the Use of Boron Suboxide.

boron (boron suboxide) to copper and see what luck he would have. He added about 0.1% and after a short time brought me a sample bar which looked good. The same measured up to 94% conductivity of Matthiessen standard.

The first simplification consisted in the substitution of boron suboxide flux for boron suboxide. Boron suboxide is made by reducing boric anhydride with magnesium, aluminum, or an alkali metal, and chemical treatment of the reaction product. For copper casting it is, however, unnecessary to treat the product as the ingredients of it (excess of boric anhydride and of borate) outside of boron suboxide are harmless or even useful in diluting the active agent. Of this boron suboxide flux 0.75 to 1% has to be added (equivalent to 0.08 to 0.1% of boron suboxide).

This is the flux at present used. However, any material which contains boron in a state

*Abstract of a paper read at the meeting of the American Institute of Metals, held in Buffalo, N. Y., Sept. 24-27th. 1912.

†With the General Electric Co., Lynn, Mass

of oxidation below that of boric anhydride is a flux for copper casting. Among other compounds of boron which satisfy this condition I mention boron carbide or any alloy of carbon and boron.

In order to better make the boron react on the copper or rather on the gases in the copper, I thought it would be best to superheat the copper and I did that although I was told that this is equivalent to ruining the metal. The copper, I was told, would "burn." The result was as I expected.

After the process had been made to work many directions presented themselves for further investigation. First and perhaps the most important from the point of view of pure investigation was the question of what the boron flux actually does. We have no reason to doubt that the boron reduces some gas in the copper which is either oxygen itself or contains oxygen; it would be of great interest to ascertain the exact nature of the gas and the quantitative relations in the action of boron.

We have not done this.

Another line was to study the deoxidation of copper alloys by boron. We have done a little on that and have ascertained that all the copper alloys containing the elements, zinc, tin, lead, greatly benefit by being deoxidized by boron but we have not done as much in this direction as we would like and as we eventually will.

There remains for me to give you some details of how the process of boronizing copper is carried out and what precautions are to be taken in order to secure a good casting.

The boron suboxide flux can be added to the copper in different ways which are equally good. In the Lynn Foundry our pots contain about 125 lbs. of metal and up to the present coal furnaces have been used. The method used in the Lynn Foundry consists in mixing half of the boron flux to be added with charcoal, putting it on the bottom of the pot and melting the copper down. When the copper has reached the necessary temperature (the copper can be heated too low but not too high) the pot is taken out, the slag skimmed off and the second half of the boron flux added and thoroughly stirred in. After a minute or so the slag comes up to the surface in the form of fused lumps and is skimmed off and the melt is cooled down by adding gates or risers until the proper pouring temperature is obtained.

In case a reverberatory furnace is used, as in Schenectady, the procedure usually followed is to put the flux in the ladle pot on the bottom, pour the copper over it and stir thoroughly.

The skimmer and stirrer are preferably not of iron since it is difficult to avoid a solution of a slight amount of iron in the copper and a resulting lowering of conductivity. If done very carefully the amount of iron would probably be very small but we did not find it practicable to trust the foundry men with an iron skimmer or stirrer. Heavy graphite stirrers and skimmers, made of Acheson Graphite, have proven sufficiently rugged for use and are being constantly used in the foundry.

The boronizing process delivers a good metal and the production of a good casting depends now on the same factors as in other metals. The copper shrinks rather considerably, about ¼" to the foot, and this must be taken into consideration. The casting must be well fed and the sand mould must be rammed only very slightly. In case of iron moulds the iron must, of course, be covered with soot and in some cases it was found desirable to use a graphite plate where the hot metal first strikes. In the case of induction rotors it was necessary to overcome difficulties due to the shrinking and cracking of the different parts of the copper casting.

When these precautions are taken no more difficulty is experienced in casting copper than in casting ordinary brass.

The electrical conductivity obtained can be as high as 97% of the Mathiessen standard but in the foundry, using scrap, which is not always as clean as could be desired, we find it not feasible to guarantee more than 90% conductivity.

The mechanical properties are as follows:

Tensile Strength	Elastic Limit
24350 lbs.	11450 lbs.
Elongation	Reduction of Area
48.5%	74.49%

Vienna-lime used in polishing contains paraffine and is used for a binder. Goods buffed with it are difficult to plate over again on account of the trouble in removing the film of paraffine with the usual grease removing alkalies

Aluminum Prices Abroad.

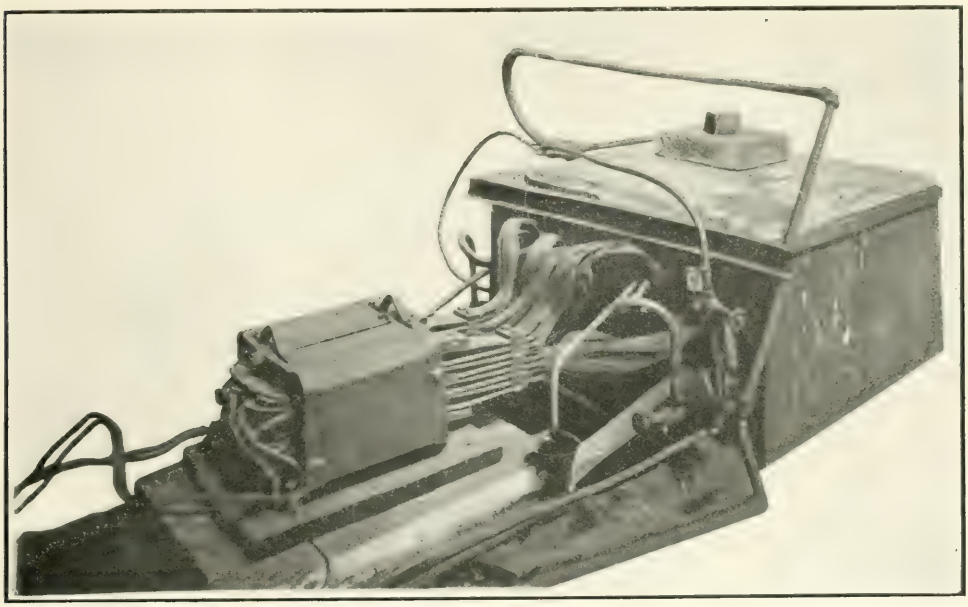
The following item from the *Daily Consular and Trade Reports* indicates what the aluminum situation abroad will be for the coming year:

The International Aluminum Syndicate has now fixed the price of the metal for next year's delivery at 160 marks per 100 kilos ($380 per metric ton of 2,204.62 pounds or 17¼ cents per pound) with the usual increase for special marks. The syndicate, however, will not dispose of the entire output for 1913 at this price, there being a general view among members that production during the next 12 months will not be able to keep pace with consumption, and that still higher prices will be possible. On the other hand the syndicate has all along been very emphatic in asserting their intention of in no way handicapping the development of the aluminum-consuming industries by unduly raising prices. At $380 (or 17¼ cents per pound) per ton manufacturers have quite a good margin of profit, though the price can not be considered at all excessive in view of the present levels of metals generally, and particularly of copper and tin. It is understood that makers are making arrangements to increase production should demand warrant it.

The Electric Furnace for Brass Melting.*

By G. H. Clamer† and Carl Hering.

With the rapid development of the electric furnace the question is often asked whether it is applicable to brass melting. This question cannot be answered in a general way with a simple yes or no, because so much depends on local conditions, especially on the cost of electric power, on the particular furnace used and on the specific requirements. It was thought best therefore to give in the present paper a general discussion of the various factors involved, including what data there is available, from which a better idea may then be obtained of the applicability of the electric furnace to any specific case.



A 30 KW Experimental Electric Furnace. This is a Stationary Furnace. It is Intended to Make Large Furnaces of the Tilting Type. This Furnace Holds About 150 lbs. of Brass. The Casting Spout is the Front of the Furnace.

In general, it may be said at the start that the cost of the electric energy is by no means the only important factor, nor necessarily the most important one, as there are other ad-

*A paper read at the Meeting of the American Institute of Metals held at Buffalo, N. Y., Sept. 24-27, 1912.

†Vice-President, The Ajax Metal Company, Philadelphia, Pa.

vantages of the electric over the fuel furnace, which may be of equal and even greater importance and money value. The final verdict of course is the usual one, "does it pay", and therefore all the factors which make up the final cost should be duly considered.

A crude idea of the cost of heat produced in different ways is shown by the following figures, and for simplicity in comparison; and calculations all the data in this paper, whether it refers to heat or any other form of energy, will be given in terms of the more convenient and more universal unit, kilowatt-hours, that is 1000 watt-hours; a British thermal unit is equal to 0.29303 (approximately 5/17) watt-hour, and a kilogram calorie to 1.1628 (approximately 7/16 watt-hours; or one watt-hour equals 3.4127 (approximately 17/5) thermal units, or 0.85998 (approximately 6/7) kilogram calorie.

Assuming that all the energy from the following original sources is converted into useful heat, then 1 kilowatt-hour in the form of heat will cost as follows:—

From electric power at 1 cent per horse-power hour	1.34	cents
" water power at $20. per kilowatt year (Niagara Falls)	0.228	"
" water power at $6. per kilowatt year (Norway)	0.0670	"
" wood at $4. per cord	0.0525	"
" coke at $4 per gross ton	0.0479	"
" crude oil at 2 cents per gallon	0.0457	"
" coal at $3. per ton	0.0292	"

With such a large difference in the costs of the original sources it is evident that to be cheaper than fuel heat, electric heating must possess other and more important advantages of money value.

One of the most important of these is that in a good electric furnace nearly all of the energy is converted into useful heat in the metal, while in a fuel furnace by far the greater part, probably about nine-tenths, goes up the chimney as waste, and this becomes worse the higher the temperature of the metal (as the chimney gases must necessarily always be considerably hotter than the metal, which they have heated or else they would not have imparted their heat to it. With the electric furnace there are no chimney gases, hence no corresponding losses). In some electric furnaces nearly all of the best of the heat goes into the metal directly, being generated in it, no matter whether the temperature is high or low, hence the efficiency of this part of the operation is nearly perfect.

A comparison of the mere costs of a unit of heat from different sources is therefore not by any means a true criterion; moreover with fuel heat the cost of the useful heat is largely a matter of temperature also as the losses become far greater, the higher the temperature. With the electric furnace this is not the case, the efficiency of the production of useful heat being practically independent of the tempreature. Many of the objectionable features of fuel heating, such as oxidation volatilization of the zinc, absorption of sulphur, etc., do not begin until a certain temperature is reached; hence if the cold metal is pre-heated by the hot gases of fuel heat to this temperature before it enters the electric furnace, the advantage of each of the two methods of heating may be profitably combined. The writers are of the opinion that this combination, consisting of a preheating of the cold charge by fuel heat, and then developing the higher temperature by electric energy will be the method of the future in the economical use of the electric furnace for brass melting, when the cost of the electric energy is relatively high.

This preheating method is quite different from the often proposed simultaneous heating by fuel and electric energy combined, that is by adding fuel heat over the top of the charge in an electric furnace. In the latter case many of the objectionable features of fuel heat still exist, hence many of the advantages of electric heating would be lost, and moreover the best forms of design of a furnace for a fuel and for electric heating are so different that they cannot be combined to the best advantage. In an electric furnace, the upper surface of the metal and the space above it should be made as small as possible, while for fuel heating, both should be made larger to provide for a combustion chamber and a large heating surface. Nevertheless in

such furnaces in which the liquid metal is heated electrically from the bottom and the cold metal is charged on top of it, important advantages might still be gained by such a combination.

There is another advantage of this preheating. When a hot piece of metal falls into melted metal it is more easily wetted by the liquid metal than when cold and when thus wetted it takes up the heat from the liquid with remarkable rapidity, far quicker than metals take heat from hot gases. This means that the melting of a charge is accomplished more quickly, which in turn means a greater output per day from a given furnace, or a smaller furnace for a given daily output, hence less plant charges. Also less idle time for the laborers, and less loss of zinc, as the metal is held liquid during less time.

One of the important advantages of some of the electric furnaces is that they can be forced, that is that large amounts of heat can be forced into a relatively small furnace quickly; in fact it is actually running the furnace to better advantage to do so, as the heat losses from the outside of the furnace are thereby reduced per pound of charge because the time during which that pound is being heated is less. This again means less plant for a given daily output, less loss of time and attendants, and less loss of zinc.

Electric energy purchased from large power plants always costs less if used continuously during 24 hours of the day; and moreover considerable heat is used in first heating up a cold furnace, although this may sometimes be done with fuel heat. Hence whenever practicable, it is far more advantageous to operate an electric furnace continuously 24 hours per day; this is more important with electric than with fuel furnaces.

In some cases electric energy can be bought for a lower price, if used only during certain hours of the day, when it is not required for public service, say during the latter half of the night. This is technically called "Valley load service". This may be worth considering for foundries located in cities, taking current from city mains.

Another saving in electric furnaces, which may be taken advantage of whenever possible, is in being able to use a lower furnace temperature (hence involving less loss of zinc) by casting directly from a tilting furnace by bringing the moulds to the furnace. This saves the excess of temperature necessary to supply the loss of heat in the pouring ladle, as also the labor cost of handling this ladle.

One of the great advantages of the electric furnace is that the metal may be melted entirely in a non-oxidizing atmosphere; in fact if some charcoal is added the atmosphere in the furnace may even be made reducing. There is therefore less loss of metal by oxidation, in fact there ought to be none at all, and possibly even a recovery of some of that which was oxidized. The value of the metal thus saved may be greater than the cost of the electric energy. This non-oxidation also means that such raw materials as finely subdivided metals like borings, grindings, fine concentrates, etc., which cannot be satisfactorily handled in fuel furnaces can be readily melted because they will flow together more easily, which in fuel furnaces can be accomplished only with fluxes and these, besides involving a first cost and the cost of the heat for melting them attack the crucible and the metal in them is lost as oxides in the slag. In reverberatory and especially in cupola furnaces these losses of metal are increased still more due to the mechanical loss of fine particles which are carried off by the rapidly moving gases; also to the greater loss of zinc owing to the excessively high temperatures and the longer time required during which the zinc loss continues.

According to the Bassett 6% of the zinc in brass is lost by vaporization in the melting and casting of brass for rolling for a 2 to1 brass this means about 2% by weight of the original brass. When the furnace is closed, as is possible with an electric furnace, this ought to be mostly saved.

Owing to the absence of contact with the fuel gases in an electric as distinguished from reverberatory furnace, there is also less contamination of the metal by sulphur and other objectionable fumes; and with the absence of the sulphur there is a greater fluidity of the metal hence, there will be less castings that are faulty and a greater freedom from blow holes.

Another advantage lies in doing away with the crucibles. Their cost averages about 12.5 cents per hundred pounds of brass in the ordinary crucible furnace and 5 cts., in the tilting, stationary crucible furnace. Against this is the cost of relining the electric furnace, but this is negligibly small in comparison, except arc furnaces, in which the repairs of the

roof are an important item, owing to the very intense heat to which it is exposed.

In those forms of electric furnaces in which there is an agitation of the liquid metal, as distinguished from a quiet melt, there will also be a better mixture of the metal, that is a greater uniformity, and in one of the forms of electric furnaces mentioned below, in which there is a continuous strong upward flow of the heated liquid metal, like the rising water in a rapidly boiling kettle, all of the metal in turn is forced repeatedly to the top, hence any mechanically suspended particles of dirt will be rapidly brought to the top with it and as these are always higher than the metal they will stay at the top where they can be skimmed off with the slag. There will therefore be a mechanical cleaning or refining similar to that which would be produced by gravity if the metal were kept at rest for some time, while hot, but with this forced upward flow it is done far more rapidly economically and presumably more perfectly and there is therefore less loss of zinc which continues as long as the metal is kept hot. As it is possible to reach a higher temperature more quickly hence also with less losses of zinc, greater fluidity may be obtained, hence sharper castings. The temperature can be very easily controlled in an electric furnace and there is therefore no reason why there should ever be any waste due to excessive heating. It could be controlled so closely that uniformity in the castings as far as it is goverened by temperature ought to be easily obtained.

Finally there is the factor of convenience and cleanliness; no coal bins—no handling of coal and ashes, no making fires; no waiting for fires to become hot, no chimney, etc. And as there are no exposed flames as the outside of a well built electric furnace ought not to be more than warm, there is the important factor of the comfort to the workman. The above will give a general idea of the advantages to be derived from electric over fuel furnaces for brass melting, exclusive of the cost of the source of the heat. These have more or less money value depending upon the particular conditions of the plant and the nature of the castings and this money value should be taken into consideration, as it is one of the important factors.

The following figures will show the possibilities and the limitations of electric furnaces as far as the power consumption alone is concerned. The original dates from which some of these figures are computed are somewhat meager and not as complete and precise as would be desired, hence the results are necessarily only approximate but they are believed to be sufficiently accurate for the present purposes.

To melt and superheat to a casting temperature of about 1000-C (1832 F), 100 pounds of ordinary brass consisting of 2 copper and 1 zinc, requires about 6.9 kilowatt-hours starting with cold metal and assuming no losses of heat. The efficiency of a good electric furnace ought to be about 70% to 75% and may even be greater but even allowing only 65% it would require about 10.5 kwh delivered to the furnace. Hence at 1% per kwh, it would be 10.5 cents per 100 lbs.; or if the electric energy was generated by oil engines at the foundry it could probably be produced for less than half a cent per kwh, at this figure the cost would be 5.75 cents per 100 lbs. This is for continuous operation; if the furnace is started cold every morning the heat for the initial heating must be added most of this heating could be done with an oil blast.

If it is a resistance furnace in which no such excessively high temperatures are produced as in the arc furnace, there ought to be practically no loss of metal except what zinc may be vaporized and as such furnaces can be kept closed and have no draught of hot gases passing through them to carry away the zinc vapor, there should be little zinc lost, especially when the heating and casting are done quickly.

If the initial loss of metal in fuel furnaces besides the zinc is taken as 4%, which is probably below the average and if say half of this is recovered in the foundry which is also liberal the loss of 2 pounds in 100 if taken at 10 cents per pound is 20 cents per 100 pounds. Hence according to these figures which seem to be conservative the saving of metal alone, namely 20 cents much more than covers the cost of the electrical energy, namely 10.5¢ say 1 cent per kwh, in fact this saving is nearly twice as great as the cost of the electric heat and in addition there is the saving of the entire cost of the fuel and crucibles for the fuel heating. And at 5.75 cents for electric power generated on the premises at 0.5 cents per kwh, the saving is still greater and con-

siderably so. It will be noticed that this allows for a 2% loss of zinc in the electric furnace which is probably considerably greater than the actual loss would be. With such a large margin to its credit it is hardly worth while to go into more refined calculations.

Acording to the guarantees of the makers of some oil engines, it would require less oil to operate the engines for generating the required electrical energy, than it does when the oil is used directly as fuel for melting. This is due to the fact that when burned in melting furnaces the heat of the oil is used very uneconomically, the loss of heat being probably about 90% while in the engine much more of its energy becomes available and in the electric furnace this energy may be gotten into the metal as heat with a very high economy. Or in other words for oil the combined losses of energy in the engine dynamo and electric furnace are less than the heat losses in the fuel furnace; the cost of the plant however is greater. This saving is in addition to the one mentioned above from the smaller loss of metal.

Besides both of these sources of saving there will be in the opinion of the writers an additional gain possibly by preheating the cold metal with oil and generating only the higher temperatures electrically. It is probable that about 2/3 of the total melting and superheating can be gotten into the cold metal directly by means of hot gases without loss by oxidation sulphur, etc., as the metal would then be still considerably below its melting point; and this heat would unquestionably be gotten into the metal far more efficiently as the gases could be made to leave the metal at a very low temperature by passing out over the coldest metal, say in a slowly revolving drum.

Assuming that this heat for preheating was used a little more than three times as efficiently which is surely well within the actual then it would take only one fifth of the amount for the preheating that it would for the complete melting hence there would be a saving of 4/5 of the oil. Against this 1/3 of the total heat energy would have to be generated electrically; this from the figures given above would be 3.5 kwh. for a furnace efficiency of 65%. If it takes 2 gallons of oil per 100 pounds in an oil furnace at 3.5 cents per gallon the cost would be 7 cents. One fifth of this would be 1.4 cents leaving 5.6 cents for the 3.5 kwh. of electric energy which would be at the rate of 1.6 cents per kwh. Hence if the electric energy can be bought or produced below 1.6 cents per kwh. there would be a saving due to this preheating and this is over and above the value of the metal saved. As current may be bought at less than this price in many cities, such a combination would no doubt prove profitable in such case.

With less fusible brass of 80 copper and 20 zinc a similar result could be shown with probably even greater savings as the lost metal has a greater value per pound and the melting temperature is higher hence is more costly to reach with fuel. The energy required for melting and superheating 100 pounds to about 1100 C (2012 F) is approximately 8 to 8¼ kwh., assuming there is no loss of heat. For red brass and the bronzes the saving would be still greater owing to the greater value of the metal saved. In a certain large foundry a 2% saving of these non-ferrous alloys would sometimes amount to about a ton a day.

The following data deduced from the presumably reliable figures for the specific and latent heats gives the energy required to melt and superheat (about 10%) 100 pounds of the corresponding metals assuming there are no losses of heat. They should be accepted only as approximations.

Aluminum	13.9	kwh per 100 pounds
Nickel	12.	" " " "
COPPER	8.7	" " " "
Brass 80:20	8.2	" " " "
Brass 2:1	6.0	" " " "
Bronze	6.0	" " " "
Platinum	5.0	" " " "
Zinc	4.1	" " " "
Tin	1.6	" " " "
Lead	0.01	" " " "

The apparently large discrepancy between aluminum and platinum is due to the fact that the former is very light metal and the latter a very heavy one. Although no great precision is claimed for these figures yet they are believed to be sufficiently accurate that any claims made for melting with appreciably less than these theoretical minimums may safely be taken as impossibilities. Such claims have been published to advertise furnaces. The following figures compiled from various presumably reliable sources give the actual consumption in fuel furnaces per 100 pounds of metal:

Brass ..1.8 gal of oil
" ..18 lbs. coke improved furnaces forced draught
" ..50 lbs. coke old type pit furnace
" ..40 lbs anthracite
" ..45 lbs. coke given as usual practice
Bronze..3.8 gal. of oil
" ..3.0 gal. of oil

Electric furnaces may be divided into general classes, arc and resistance. In the former the heat is generated and in an electric arc formed in a short space between the electrode usually of carbon or graphite and either the metal the slag or another electrode. The heat is generated mostly in the arc itself and only part at the electrodes; hence the heating is entirely from the top and must therefore flow down into the liquid metal by conduction, which takes time it may be said that heat does not like to flow down in liquids. Moreover the heating is mostly by radiation from the arc or by the contact of the vapors from the arc hence the transmission of heat to the metal is limited in speed largely to this radiation and cannot be forced; moreover the roof of the hearth is also subjected to these very high temperatures.

The temperature of this arc is that of the vaporization point of carbon and is therefore extremely high over 3000 C (5432 F) which is high enough to volatilize all metals. It is therefore excessive and the metals ought not to be directly subjected to it. Hence an arc from carbon to non-ferrous metals is likely to cause serious losses of the metals by vaporization especially of the zinc in the brass. In all arc furnaces the carbon must be moved forward as it burns away and when the arc goes out it must be started again by a movement of the electrode hence they require continuous attention. In one type of furnace the arc is produced between an electrode of carbon and thick blanket of slag which covers the metal. In this way it heats the slag chiefly by radiation and the metal beneath receives its heat entirely from the hotter slag. A transmission in a downward direction which is necessarily limited in speed and cannot be forced except by heating the slag to a much higher temperature than the metal. The energy used in heating the slag should be taken into consideration as it is probably not small. Very good results in brass melting are reported to have been obtained from this type of furnace.

Another method is to heat the interior of the walls of the furnace with the arc and then revolve the whole furnace so as to bring the metal over the heated walls. Although ingenious it also seems a slow process which cannot be forced and involves greater losses through the walls, as they must be heated to a much higher temperature than that required by the metal. Another method is to heat by radiation alone, by having the arc entirely above the metal and between two carbons. Good results have been claimed for such a furnace for brass although the zinc loss was probably somewhat excessive. Moreover it cannot be as easily forced as a resistance furnace and the roof is likely to give trouble owing to the excessively high temperatures.

In the resistance type furnace the heat is generated by passing the electric current through a solid or liquid. The only practicable ones for brass melting seem to be those in which the current passes through the liquid metal itself or through the slag. The well known induction furnace is of the type but as we believe it has not been applied to any extent to brass, it needs no further comment here. It seems that brass has too low an electrical resistance for succesful operation, these furnaces are in successful use for steel which has a higher resistance.

In another type the heat is generated in a moderately high vertical column of material like slag or glass over the hearth by passing the current through it by means of electrodes. The cold metal is then placed on the top of this liquid and is melted as it descends through it. It has been in apparently successful use for fine concentrates, but we do not know of its having been used for brass. Large pieces would be likely to sink through before they are melted and we understand that there is danger of the charge freezing in the bottom.

In another type of resistance furnace with which the writers have been experimenting and which they are now developing and expect to soon place in commercial operation, small portions of the liquid metal are heated with great rapidity in cylindrical holes in the bottom of the hearth and then ejected at once with considerable force into the main body of the molten liquid, fresh metal being continuously sucked into these holes. The time in which each particle is heated and ejected is probably only a fraction of a second. This ejecting is produced by a peculiar recently

discovered electromagnetic force called "pinch effect". All the heat in the furnace is therefore generated directly in the metal itself exactly where it is wanted hence with no initial loss at all that is with perfect ef ficiency; it therefore reaches the metal instantaneously instead of by the slow process of conduction and radiation. The highest temperature is moreover in the liquid metal itself where it is wanted as distinguished from being above it or in the slag; and the heating is done at the bottom of the liquid which is the more rational place as heated metal always rises. The only losses occur after the heat has been in the metal, being those through the walls and the top surface; there should be no loss of furnace heat through the electrodes although there will of course be some loss of electrical energy in them. All of these losses can be made small by proper designing hence this furnace promises to be very ef ficient.

It has the further great advantage that it can be forced to as high a degree as desired, that is, the heat can be generated in the metal in very great quantity and therefore the heating can be done rapidly hence a small furnace can be made to have a large daily output, and, therefore, also less loss of heat per poun. of metal.

It is started with a small charge of molten metal or from a small portion of the frozen metal left in it from the previous charge, and the melting is done by charging the solid metal into the superheated liquid metal by which method the heat is transmitted with very great rapidity to the solid metal, especially if the latter has been preheated by hot and reducing gases so that it becomes wetted by the liquid.

The systematic and quite pronounced upward circulation of the hot metal which is ejected from the heating holes in this furnace brings all the metal repeatedly to the surface where the suspended impurities and dirt are set free and can therefore be easily removed as they collect, thus purifying the metal mechanically by what has been designated as a "boiling action." This circulation also mixes the charge very thoroughly thus making the metal homogoneous.

Various metals and alloys like brass, bronze, iron, steel, nickel steel etc., have been melted in this furnace very rapidly and with a remarkably high heat efficiency considering the crudeness of the experimental furnaces and their small sizes. The results of the preliminary tests are now so satisfactory and encouraging that a moderately large furnace for melting bronzes and another for steel are about to be constructed and will soon be in commercial operation.

Improved Process of Casting Silicon by Means of Magnesium.

Silicon is now being cast in sand in various shapes for use in the chemical and electrical industries. When melted and cast alone, the problem is much the same as that of casting copper. The casting comes spongy and full of blowholes.

Thomas B. Allen has patented a process for the Carborundum Company of Niagara Falls, N. Y., for casting silicon so that a sound casting can be obtained. The silicon is melted in a crucible and kept covered with coke to prevent oxidation. About 0.50 percent of magnesium is then introduced into the molten silicon for the purpose of combining with the gases and preventing the formation of blowholes. The magnesium should be in the form of small pieces and is introduced into the melted silicon by means of a "phosphorizer". This is the regular graphite phosphorizer sold by crucible manufacturers. The inventor states that from 0.50 to 3.00 per cent of magnesium can be used.

The magnesium, unites, in addition to the gases, with any oxidized silicon that may be present on the top of the molten metal and forms magnesium silicate, readily fusible and which produces a slag easily skimmed off.

Dry sand molds are recommended for the casting of the silicon, and good sized risers so that pressure is put upon the metal. In this manner, the inventor states, it is possible to obtain the casting of the silicon in the form of fine crystals. If the risers are not used, then the casting will be coarsely crystalline.

When a brass solution deposits brass of several different colors, there is too little free cyanide in the bath. Under such conditions, the anodes will probably be found coated over, but the addition of free cyanide will clear them up and a brass deposit of uniform color will be obtained.

Correspondence.

Blistering of Silver Deposit Work.

Editor:

Your answer to Question No. 1193 in the September issue of THE BRASS WORLD, in which you state the cause of flaking or scaling of the design when heated in the muffle is caused either by the use of the wrong heat in firing or an unsuitable flux in firing, is, I believe, wrong. My idea of the cause is as follows:

There are two causes for the blistering of silver deposit work. If the paint has become too "fat", either through adding too much "fat" oil, or by the paint being used too near an open window, without being protected from the wind, the turpentine will dry out quickly and by the continual addition of it, the paint becomes too "fat". This, when put into the kiln, will make the paint blister in spots, especially when the design has to be gone over more than once with the brush.

The other cause is what is called "sweating" of the glass. When the humidity is high, the moisture in the air seems to condense under the paint, and when it is fired it can be brushed right off. The remedy is to dry the paint as soon as the article is painted, using a hot air oven. Those used at home for baking will answer. In the winter, if the factory is not heated at night, the glass, being warm during the day will "sweat" at night and this will affect the paint unless it has been dried.

If the flux was to blame, it would be impossible to do good work at all.

NEWARK.

If, owing to the absence of statistics, it is not possible to indicate the exact value of the importation of silver into Turkey, the trade done in this article annually at Constantinople is estimated at about $300,000 according to the Bulletin of the French Chamber of Commerce of that city. The same journal draws the attention of manufacturers to the development of the trade in fancy articles in the Ottoman Empire, because everything of this nature which was formerly made in crystal or porcelain is now sold in plated metal. The deliveries are generally effected f. o. b. Constantinople, and the credit allowed is six to nine months.

Correspondence.

Price of Boron Suboxide for Deoxidizing Copper.

The interest that is being displayed at the present time in regard to boron and boron suboxide for use in deoxidizing copper castings (see article by Dr. E. Weintraub in this issue) has likewise created an interest in the cost of the material. The following letter is self explanatory:

Editor:

In reply to your letter of September 30th., regarding Boron Suboxide.

This compound may be purchased from this company at $2.50 per lb. and one pound is sufficient to deoxidize 100 lbs. of melted copper. We have a patent covering the use of Boron Suboxide, but the sale is at present outright as we have stated.

GENERAL ELECTRIC COMPANY,
Schenectady, N. Y.
Oct. 2nd. 1912. Supply Department.

Brightening Gold Deposits by Means of Nickel.

By A. Bidet.

There is always a desire to produce a bright gold deposit and in many instances it is absolutely necessary that it be done. Cheap work that will not allow burnishing, on account of the cost, requires bright gilding. A gold deposit may be brightened by means of nickel in the following manner:

Take 1 oz. of nickel cyanide, made by precipitating a solution of nickel sulphate (single nickel salts) by means of potassium or sodium cyanide. The precipitate is washed well before using. Then dissolve in potassium cyanide so that just enough cyanide is used to take it up *and no more*. There must not be any free cyanide in it.

Add the solution of nickel thus made to 2 gallons of 14 karat gold solution and deposit it on the gold as usual. It will be found of great advantage when cheap, polished work is required.

A red color on brass castings is obtained by pickling them in a sulphuric acid pickle. The zinc is dissolved from the surface leaving the copper. The pickle works more rapidly if hot.

The Rockwell "Underfired" Annealing Furnace.

One need not look back many years, particularly to about the time that oil first began to be used in annealing, to recollect the manner in which an annealing furnace was constructed. Oil furnaces, perhaps, were the most flagrant type and the first form consisted of an ordinary muffle furnace with several burners on each side at the top and impinging directly upon the metal. The metal, brass, copper or German-silver, was placed in a pile on a muffle pan and the annealing commenced. The heat was so intense that it was not unusual to have the top of the metal melted when the bottom was not red hot. Were this not the case, there was invariably an uneven heating so that the bottom metal was not completely annealed, and as it remained hard, many roll breakages resulted.

The object has been, since the aforesaid condition took place, to design a muffle for annealing that would produce an even heat and thus anneal the metal uniformly so that all portions would be heated alike and with the same rapidity. Until the "underfired" annealing furnace made its appearance this feature had not been obtained with any degree of satisfaction.

The "underfired" annealing furnace has been in use for several years and has proved very satisfactory. The type herewith illustrated is the production of the W. S. Rockwell Company, 50 Church St., New York City, the well known furnace engineers, and was recently patented by them. It is adapted for general rolling mill work and for the annealing of brass, copper, German-silver, sterling-silver and steel of various kinds. More than eighty of the furnaces are in use at the present time.

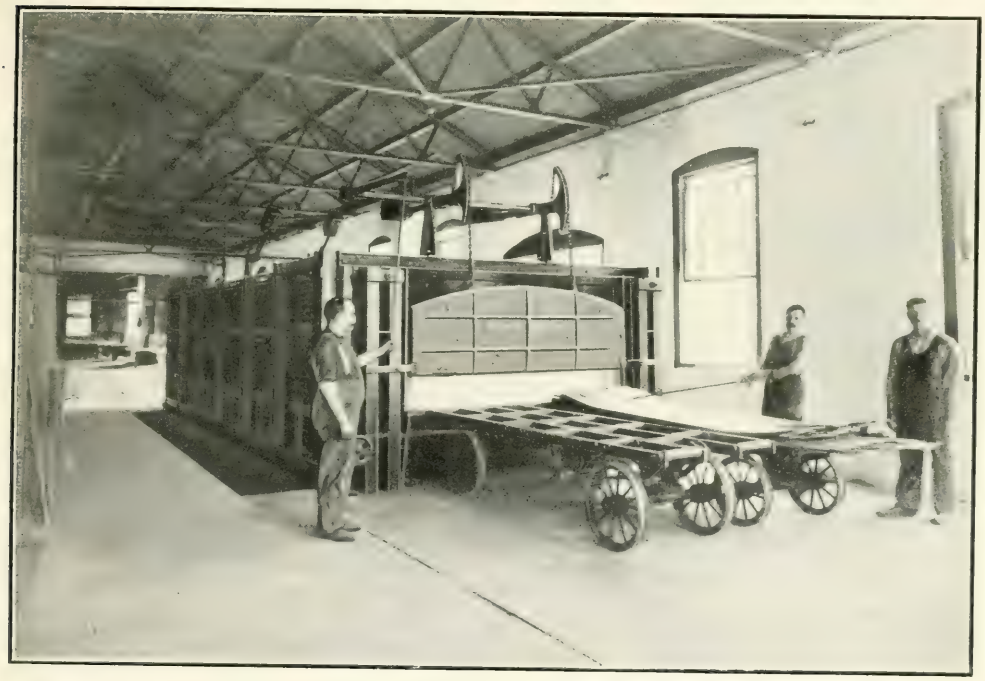


Fig. 1. Rockwell "Underfired" Annealing Furnace for Annealing Sheet Metal.

The advantage of "underfired" annealing furnaces is the even heating which the metal receives. The combustion chambers are equally distributed directly under the entire annealing chamber and the annealing chamber floor is so perforated that the heat can rise gently in direct contact with the bottom of the annealing pan carrying the metal to be an-

nealed. This is the reverse of the condition that has long existed in all the previous overfired furnaces.

In the "Rockwell" under-fired annealing furnace many new features have been added. Difficulty was first experienced in finding a material for the arch over the combustion chamber, but this has been obtained and the difficulty overcome.

A feature overcome in the use of underfired annealing furnaces, is the difficulty previously experienced at the bottom. When a batch of metal was withdrawn from an old fashioned overfired furnace, the bottom of the

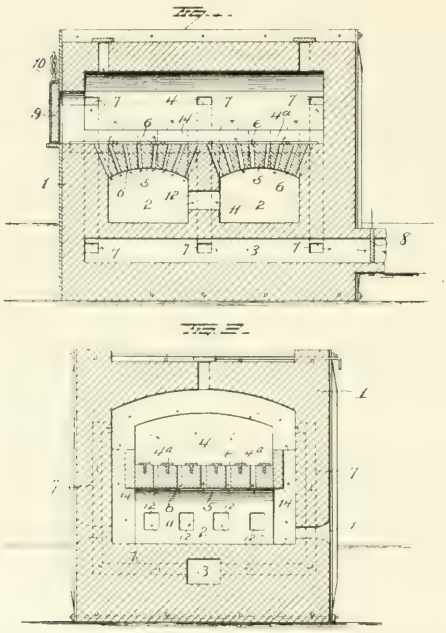


Fig. 2. Sketches Showing Method of Constructing the Furnace.

furnace would have a black appearance, indicating a lower temperature than the remainder. This very fact was responsible for not only imperfectly annealed metal, but roll breakages. This is caused by taking it for granted that the metal is thoroughly annealed when it is not. The "pinch" used in the subsequent rolling during the first pass, is based upon soft stock. When hard stock, such as metal from the bottom of the pile, is put through the rolls, it is incapable of standing this "pinch" and if thick, as it usually is in the case of metal that has only the "breaking down" operation put upon it, the rolls or roll will break.

The advantage of underfiring with its even annealing therefore becomes apparent as not only is the pile of metal annealed evenly, but the roll breakages are reduced to a minimum.

In the improved, underfired annealing furnace recently patented by the W. S. Rockwell Company, and illustrated in Fig. 2, the combustion takes place in a compartment separate from the metal being annealed, yet near to it so that the maximum efficiency is obtained. Not only can the hot gases travel in a natural path, but the radiant heat also. The whole problem has resolved itself into one of even, uniform annealing.

Metal annealed in the furnace, it has been found in the rolling mill, rolls evenly to gauge, cleans easily and has a good color. It is not oxidized, as the tendency of gases to rise, fills the top of the muffle completely, covering the metal and protecting it from atmospheric air. In the overfired furnace, the gases rise in the same manner, but do not fall so that the metal is not enveloped with them.

A New Method of Electroplating Glass and Other Vitreous Materials.

A new method of electroplating glass, stoneware, porcelain and other vitreous substances has been patented by Milton W. Franklin of the General Electric Co., of Schenectady, N. Y. The process, it is stated, is particularly applicable to the coating of glass condensers, ozone tubes and other electrical apparatus with metal. The method is described by the inventor as follows:

The method formerly in use for coating non-conducting material, such as glass, with metal consists in first covering the material to be coated with a varnish, such as copal or shellac. The varnish furnished a sticky surface which was coated with graphite, and was then made the cathode in a plating bath. In the finished product the metal film is attached to the glass, or other vitreous surface only by means of the varnish, which renders the articles thus plated unfit for use at high temperatures. Even at ordinary room temperature the metal coating can be easily peeled off.

I have discovered that when the non-conducting surface is coated with an adhesive which is permeable, and preferably also

soluble, in the plating electrolyte, and a conducting layer is applied as usual, the plated film adheres very firmly to the surface upon which it is applied. To render the film of adhesive conducting, I prefer to use, in a finely divided state, the metal to be plated, or a metal with which it will readily unite and incorporate the same, as by rubbing, into the adhesive film. During the plating process, metal is deposited on all sides of each particle.

As a suitable material for the adhesive coating, I may mention gum arabic, fish glue, water shellac, gum dammar, or gum tragacanth. An aqueous, or other suitable solution of the gum is applied in a very thin layer upon the non-conducting surface to be coated. The surface is sprinkled with a very fine powder of metal, preferably of the metal to be plated, for example, copper. The copper powder is then rubbed into the film of adhesive. When the surface thus prepared is plated in the ordinary way, each grain of the original metal powder is coated with metal and the minute quantity of adhesive is practically dissolved out leaving a coating of pure metal. If any portion of the adhesive remains, it is probably incorporated with the metal.

The metal coating applied in this manner is very strong and can be removed from a smooth glass or other vitreous surface only with the greatest difficulty. Its appearance, when viewed through the glass is similar to that of a mirror of the metal.

The so-called "aluminum-coated" sheet steel, is not coated with aluminum, but with an alloy of zinc, tin, copper and aluminum. This coating metal contains about 7% of aluminum.

Weak plating solutions give a bright deposit, as a usual rule, for the reason that very little metal is deposited. Heavy metal deposits are, except in instances in which the so-called "bright" solutions are used, dead.

Zinc-dross is not dross at all, but is an alloy of zinc and iron. In galvanizing, the iron kettle and tools are attacked by the zinc, an alloy formed, and when the iron increases to a few per-cent, the alloy becomes thick on account of the increase in melting point. This is called "zinc-dross", when, in reality, it is not a true dross.

A New Form of Anode.

A new form of anode support has recently been patented by Clarence E. Leffel of the Spirella Company of Niagara Falls, N. Y. manufacturers of corset hardware. The object of the support is to prevent the waste of anodes through the formation of "butt-ends" and with this view in end, the hook and connection of the anode are made separable.

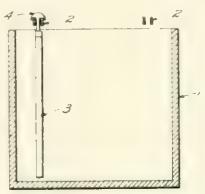


Fig. 1.

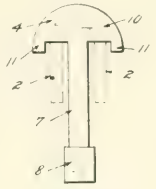


Fig. 2.

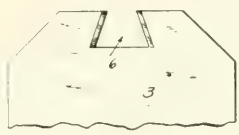


Fig. 4

Fig. 3.

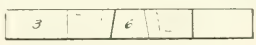


Fig 5.

Leffel s Method of Making an Anode.

In place of the usual round connections, a pair of flat bars are employed. The anode is provided with a dove-tailed pocket into which this connection fits and is driven in. When the anode has become useless, the connection is removed by driving out and is used for insertion in a new anode.

The first plant in the United States to produce aluminum was the Cowles Electric Smelting & Aluminum Co., at Lockport, N. Y. The name of this company has since been changed to the Electric Smelting & Aluminum Co.

Aluminum is now extensively used in galvanizing to produce a smooth, bright coating on the galvanized articles. Practically every galvanizing company is now using it. A very small quantity only is required and is added to the zinc when melted.

Defects in Cheap Gas Fittings and Fixtures.

That gas fittings are not always the beautily artistic things they seem to be is well known to the ironmongery trade, many members of which, having sold an attractive looking fitting to a customer have had to face that individual, then grown very irate, some days later and explain why the fitting leaked at every joint. These cheap and showy gasfittings are, of course, apt to leak—if not when they are new, certainly after they have been in use for some little time—and the causes are so simple and obvious that they might be discerned by the buyer if he cared to look for them when making his purchases.

Some of the more serious defects in the construction of cheap gas pendants arise from the use of light and cheap materials in their manufacture. A heavy fitting is almost invariably a sound fitting. The down-rod should be not less than 19 S. W. G. in thickness. Many of the low-priced pendants on the market are formed from 21 or 22 gauge tube. Such fittings may be identical in appearance with those made from the heavier material; but there is a wide difference in their respective wearing qualities. The lighter gauge tube will not yield the long, sharp, clean-cut thread that is essential for making a perfect joint. The thread will be stunted, light, and probably warped, and although it may be coaxed into making a joint more or less passable to look at, it must not be interferred with afterwards, or the chances are the pieces will not go together again. A more serious defect resulting from the use of light tube in the manufacture of down-rods arises from the fact that the body of metal in the tube is too light to take the solder. The metal is liable to become burned, and therefore extremely brittle in the process of brazing, and even if it does not do so the grip of the solder is so slight that when the tube expands and contracts owing to variations in temperature, especially near the ceiling, the solder will give way and the tube will split for several inches of its length. In cases of this kind a serious leakage of gas occurs. Occasionally such a tube will split without warning, allowing gas to escape in such volume as to constitute a grave danger. In some of the cut-lines sent out to the colonies the rods are formed from cased tubing—*i. e.*, 19-gauge iron tubing covered with about 27-gauge brass.

How to Examine the Details

The gas ways of the ball-joint, tail pipe, and cock should be clean and smooth, and of about 3/16 in. bore. Most good-class fittings are now interchangeable for petrol-air or ordinary gas, and in such cases the size and finish of the gas ways are of considerable importance. The ball-joint above all things should be thoroughly well made, the ball being cast and not stamped, and it should be well ground into the socket and fitted with absolute accuracy. It should possess such an amplitude of movement as will enable the pendant to swing to an angle of at least 25 degrees, and remain in that position indefinitely without any sign of leakage. This provision is necessary to compensate for defects in laying the gas pipes, and also to obviate risk of escapes occurring when for any reason a comparatively heavy burner and globe are removed from a double-light pendant.

The plugs also should be made to fit accurately. In first-class manufactories the operation of plugging is regarded as of the highest importance, and only men specially trained to the work and of known skill are permitted to undertake it. These grind the plugs with only just sufficient grease to lubricate the work, and are required to make a perfect fit without abrasives or adventitious aid of any sort. In the manufacture of low-grade fittings, however, the operatives cannot be allowed to spare the time to do this work properly. They grind the plugs in with grease, and when they have anything near a fit they pass the work and turn to the next piece. The result is that after the fittings have been in use for a little while and the grease has worked out the plugs are found to be leaky.

The "stops" attached to cocks are another frequent cause of trouble and annoyance in cheap fittings. Unless they are strong and securely fitted they are apt to work out. The stop is such a trifling thing, apparently, that little notice is taken when one does happen to become lost. There should be a sufficient weight of metal in all the parts, whether cast or "capstan" turned, to stand all requisite boring, tapping, and dressing without detriment to the ultimate strength of the part. In some of the cheaper fittings this is not the case. The castings are so light that when treated in the

manner described nothing remains but the merest shell, thoroughly sound superficially, but quite untrustworthy. Parts which cannot be moved should be thoroughly brazed together; on no account should the use of soft solder be tolerated.—*The Ironmonger.*

The "Paxson-Warren" Sand-Blast Tumbling Barrels.

The sand-blast has proved so effcacious in the brass foundry, and in the preparation of iron or steel castings, sheet steel and steel wire goods for tinning, galvanizing, japanning or plating that any appliance which saves labor, and at the same time utilizes the sand-blast will prove of the utmost interest to manufacturers who do this class of work.

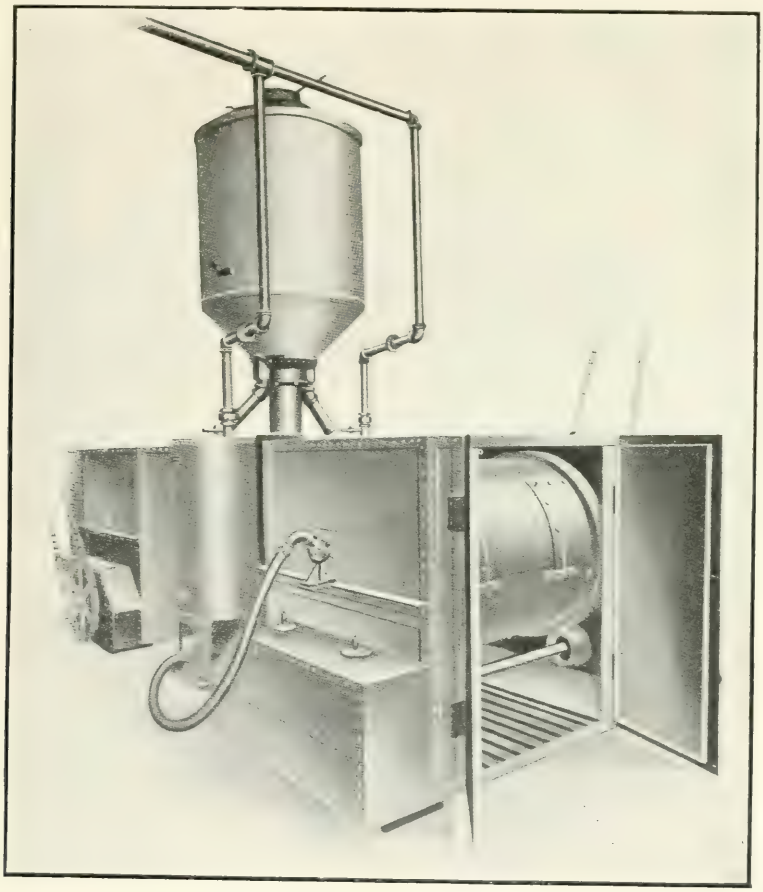


Fig. 1. The "Paxson-Warren" Sand-Blast Tumbling Barrel.

If oxidized copper work is black and sooty and rubs off, the liver of sulphur solution is usually too strong, or the work has been left in it too long.

There are three principal uses of iridium: First, as the hard, steel-like points of gold pens. Second, as a material for hardening platinum so that it will become hard and springy. Third, as a material for producing a black glaze or surface on glass or porcelain.

While efficacious, an ordinary sand-blast renders the blasting operation comparatively costly when used on small goods for the reason that each must be handled separately, if a thorough cleaning of the surface is desired. In any process, if each piece be handled, the cost is brought up. The problem resolves itself into the same condition as that of elec-

troplating dipping or japanning small goods. To be done cheaply they must be done in quantities.

The sand blast tumbling barrel, then, has solved the problem of treating small articles. They may be done in quantities and as efficaciously as though each piece were handled separately. Not only is this the case, but in the special form of apparatus, illustrated in Fig. 1, the dust will not affect the operator. This in itself is a valuable feature.

There are many instances in which the amount of goods to be sand blasted is not sufficient to warrant the outlay for an expensive apparatus, or it may be only seldom

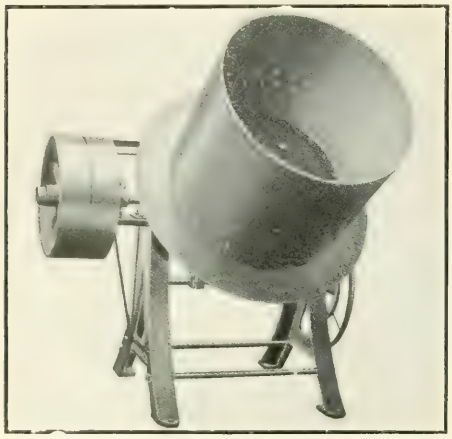


Fig. 2. Smaller and Cheaper Form of Sand-Blast Tumbling Barrel, Suitable for Many Purposes.

that the sand-blasting needs to be done. Bearing this fact in mind, the J. W. Paxson Co., of Philadelphia, Pa. have brought out the form of tumbling barrel illustrated in Fig. 2. This barrel is of the tilting type. The castings are placed in the barrel and the latter started, but revolving very slowly. All that is necessary is to turn the castings over so that the sand will strike every portion of the surface. When finished, the sand sifts out, of course, through the perforations in the shell of the barrel, and the castings can be dumped into a wheel barrow, box or other receptacle in a finished condition. Three times the quantity may be treated in this barrel in the same time that would be consumed in sand-blasting on a bench.

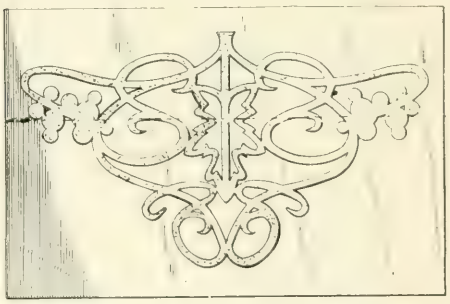
In Fig. 1 is shown a novel sand-blast tumbling barrel with a suction elevator and sand separator. This apparatus is intended for large quantities of work. The barrel is supplied with two single hose so the operator is free from any dust from the blast as the suction elevator takes care of it. When the requirements demand it, two barrels are used and when thus equipped a large amount of work can be treated. A large valve company in 10 hours treated over 10 tons of valve castings by means of it and used only 20 lbs. air pressure.

Any manufacturer having occasion to clean castings for tinning, galvanizing, plating, japanninng, enameling or for any other purpose where a clean surface is desired, should investigate these barrels. The great saving in cost will readily be appreciated.

A New Method of Ornamenting Metal Articles With Silver.

A new method of ornamenting art metal goods, jewelry etc., with silver has recently been patented by Otto L. Heintz of Buffalo, N. Y. The method is as follows:

The base metal must be of a brass containing copper and zinc in the proportion of from 80 to 95 per-cent of copper and from 20 to 5 per-cent of zinc. Upon this is placed an



Article Ornamented in the Manner Described.

ornament of silver and a flux of borax is placed between. The whole is then heated in a muffle to a temperature below the fusing point of the brass and just so that the bottom of the silver begins to melt. A critical point is then reached where the silver adheres to the brass, but does not melt and spread. The inventor states that the zinc in the brass prevents the spreading of the silver when the union takes place.

In this manner, it is stated, it becomes possible to produce ornamental articles, such as that herewith illustrated, in an economical manner.

An Improvement in Tilting Coke Crucible Furnaces.

An improvement in tilting coke crucible furnaces for melting metals in crucibles has recently been patented by W. J. Holzapfel of Eddystone, Pa. The furnace is herewith illustrated. In Fig. 1 is shown the furnace while ready for melting. In Fig. 2 is illustrated the furnace tilted while pouring metal.

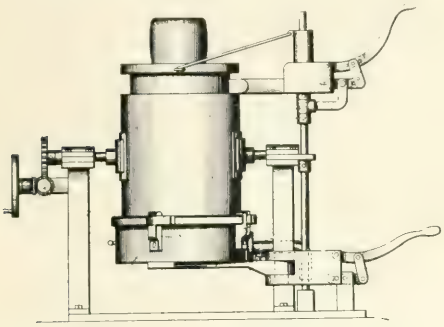


Fig. 1. The Furnace Ready for Melting.

Coke or coal is used for the fuel and at the bottom of the furnace is detachable for removing ashes or spilled metal. This bottom

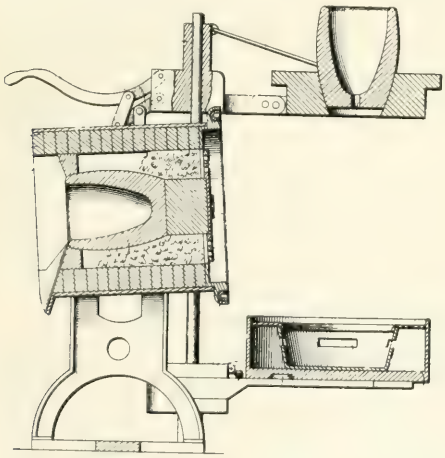
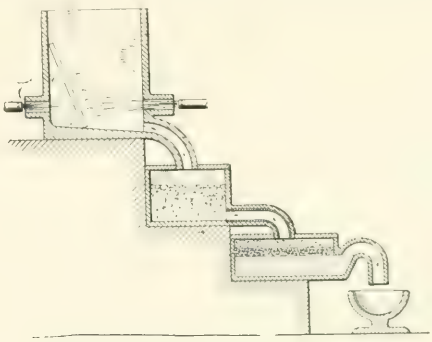


Fig. 2. Showing Furnace Tilted and With Air Box Removed.

also answers as an air box as a light blast of air is necessary for burning the fuel. The top of the furnace contains a feeding hopper in the shape of a crucible and, in fact, a graphite crucible is used. The metal is placed in this and is preheated by the exhaust heat issuing from the furnace and passing through it. The mechanism for tilting is simple and the device for lifting the cover of the furnace and the hopper is positive.

An Improvement in Refining Copper.

Walter S. Rockey and Hilliary Eldredge of the Metallurgical Research of New York City have recently invented and patented a novel process of refining copper. The copper is melted in the top chamber of an apparatus similar to that herewith illustrated and without any care to prevent absorption of oxygen.



Method of Refining Copper by Boracic Acid.

The molten copper then flows to a mass of heated charcoal and passes through it, after which it flows into a vessel containing molten boracic acid. The boracic acid removes any oxide that may be present and the copper thus produced is said to be completely refined and without the labor necessary in the ordinary process of poling. The boracic acid flux should, the inventors say, be mixed with carbon, as a complete reduction of the oxide is thus obtained.

National Electroplaters' Association.

The regular monthly meeting of the National Electroplaters' Association was held in New York on Friday evening, Sept. 27th. Four new members were elected and Prof. Firth, of the Volite Company was elected an honorary member.

Numerous subjects were discussed by the members present and among them was the use of "Prometheus" nickel salts for nickel plating. The cause of black silver anodes was likewise one of the subjects for discussion.

Questions and Answers.

QUESTION No. 1198. In casting brass for rolling, is a planed mold better than one which is not? We hear various opinions on the matter. We refer, of course, to the usual cast-iron mold employed for this purpose.

Answer. It is considered that a planed surface is not as good as one slightly rough. The reason for this is that a very smooth surface does not hold the oil that must be applied to it. A surface slightly rough seems to hold just the right amount of oil. In our opinion, the best surface is that left by sand blasting and which is slightly rough, but sufficiently so to hold the oil.

QUESTION No. 1199. What difference is there between etching on glass and metal? I have been able to do etching upon metal, but not upon glass. What is th method used for glass etching?

Answer. The only difference between glass etching and etching on metal is that the etching solution is different. The resist, whether it is the painting-on, transfer or photographic method, is put on in exactly the same manner. The glass, of course, is cleaned thoroughly before applying the resist. After this has been done, the glass is etched with hydrofluoric acid. This is the only acid that will attack glass. The etching may be done by applying the acid directly to the glass not covered with the resist, or by exposing to the fumes of hydrofluoric acid gas. This gas may easily be generated by placing some powdered fluor-spar in a lead dish and adding strong sulphuric acid to it. Hydrofluoric ocid is given off, and if the glass is placed so that it will come in contact with it, etching takes place.

QUESTION No. 1200. How is aluminum shot, such as that used in steel foundries made?

Answer. Aluminum shot, so called, is simply irregular and rounded pieces of aluminum. They are not perfectly spherical, of course, and take their name for the reason that some of the smaller pieces resemble shot. The shot are made by pouring melted aluminum into cold water. The best method is to make a flat bottomed iron ladle and bore a number of small holes in the bottom. The aluminum is poured through this and the drops issuing from the holes form shot-like pieces when they strike the water. The higher the metal is poured from the water, the more irregular the shot as they flatten when they strike the water under this condition.

QUESTION No. 1201. Can bright nickel plating be done on goods that have not been buffed to a high "color"? There is much bright nickeling done at the present time and so that no buffing is necessary, and I have been informed that it is "all in the solution", which does not appear right to us. I know a bright brass deposit can be obtained on work that has not been buffed to a "color", but from my experience with nickel plating, the same does not seem possible.

Answer. You will not be able to obtain a bright nickel deposit without first buffing the work to be plated to a high "color". This really is the secret of bright nickel plating. You will have to avoid staining or attacking the surface of the brass during cleaning, of course, and this is quite easy if you are not careless. The time of plating should be short as a long time will invariably give a dull deposit. Use plenty of boracic acid in the nickel solution as this tends to brighten the deposit and prevent staining. A deposit of from 5 to 10 minutes duration with a weak current is generally used.

QUESTION No. 1202. We are having difficulty in making castings to be used for acetylene gas apparatus. These castings at times must stand a pressure of 250 lbs. and our castings are somewhat porous. We are using a good grade of steam-metal and are melting it in coke furnaces. What is the cause of the difficulty? We believe our foundry practice is good.

Answer. It is impossible to ascertain what the cause of the leakage is without first inspecting one of the castings which leak. There are many conditions that will cause a casting of this kind to leak. They are:

1. Dross in the casting from too short gate or metal not sufficiently hot.
2. Local shrinkage in the casting caused by the pattern having been badly gated.
3. Steam-metal mixture containing too little tin.
4. Aluminum (even quite small) in the steam metal.
5. Blowholes in the casting, caused by metal that has been over-heated during melting.
6. Pattern badly made so that the core does not give an even thickness. The casting, therefore, will be too thin in certain portions.
7. Blow from core.

Dross in the casting is the usual cause and this can be avoided by pouring at the right temperature and giving plenty of gate. You cannot do better for mixture than to use a good steam-metal.

QUESTION No. 1203. Will you advise me whether boron trioxide is just plain boric acid or a mixture? If it is a mixture, what are the ingredients.

Answer. Boron trioxide, boric acid and boracic acid are commercial names for the same thing, but there is a slight difference chemically. The boric acid or boracic acid (the same thing) is boron trioxide containing water. When heated the water escapes and fused boric or boracic is obtained. This is, in reality, boron trioxide although this name is frequently used to designate boric or boracic acid.

QUESTION No. 1204. As a subscriber to THE BRASS WORLD, I wish to ask, what is the approved method of detinning scrap? If a chemical process, what is the method of re

covering the tin?

Answer. The method used by the large detinning companies is that which makes use of dry chlorine gas. This attacks the tin and not the iron or steel which it coats. The process, however, is covered with patents and requires an expensive plant. The tin may be recovered by electrodeposition, or by precipitation and smelting.

A simple method in use at one time and which is not patented makes use of the fact that the tin can be dissolved from the scrap by hydrochloric acid (muriatic acid) and then the tin may be precipitated from the solution by zinc. Galvanized iron scrap may be used. This is a cheap process if clean tin scrap is used. There is, however, so much terne plate scrap (i. e. lead coated steel containing a few per cent of tin) that unless a pure tin plate is used, the process will not work. The acid will not attack the lead. Old tin cans, while coated with pure tin, are not economical for use for the reason that the labels, food left in, and dirt, must first be removed, which is expensive. You will have to work on clean, tin plate scrap.

QUESTION No. 1205. Is there any special sand used for making aluminum castings? If so, let me know.

Answer. The sand used for making aluminum castings is the same as that employed for brass or bronze. For bench work, the sand is finer than for floor work. For the best results, the sand should be worked as dry as possible.

QUESTION No. 1206. Is there any flux that can be used for soft-hardening steel that will not rust the steel when left on it after soldering?

Answer. As far as known there is nothing which can be used as a flux that will not rust the steel if left on. It seems to us that if it would not rust it, it would not be a flux. The action of a flux is to dissolve the oxides of tin and lead formed during soldering and what will dissolve these also has action on steel. You will have to wash off the excess of flux after you are through. You state in your letter that you are using chloride of zinc. In our estimation you will find this the best.

QUESTION No. 1207. Can pure nickel tubing be made? We have never heard of this form of nickel being on the market.

Answer. It is possible to make pure nickel tubing, but we do not know how large. Small nickel tubing is used for the needles of hypodermic syringes, atomizers and similar work, but it is made from sheet metal by drawing up a cup under a press and then drawing down. We have never heard of large size tubing being made and as far as known there is no demand for it. It could probably be made by the various hot processes employed for making copper or steel tubing from a solid billet.

QUESTION No. 1208. What can be done to prevent gold plated steel goods from showing rust through the gold deposit? These come in contact with alcohol and the rusting then occurs.

Answer. We presume your gold plating is like nearly all commercial gold deposits. That is it is quite thin. We do not know what your goods are but probably a heavy gold deposit would be too costly and even could it be used, the production of a very heavy gold deposit is quite difficult as it requires constant scratch-brushing to obtain it. We suggest nickel plating the steel, buffing, then cleaning in an electric cleaner (it is difficult to remove the buffing dirt from buffed nickel with ordinary cleaners) and then gilding on over the nickel. This method will, we believe, prevent the rusting.

QUESTION No. 1209. Will you give us a good formula for an aluminum-solder?

Answer. The following aluminum-solder is good and has been used for some time. It is known as "Richards" aluminum-solder. It is composed of the following:

Tin	29 oz.
Zinc	11 oz.
Aluminum	1 oz.
5% Phosphor-Tin	1 oz.

The first three ingredients may be melted together, after which the phosphor-tin is added.

QUESTION No. 1210. I desire to oxidize some brass plated steel work with ammonia and carbonate of copper. I made the solution, but it took all the brass off the steel. At the same time I know the dip is good as it works on solid brass. Will it work on brass plated steel; or is there some reason why it will not?

Answer. Brass is brass, whether it is solid metal or plated and the dip will work as well on brass plated steel as well as on solid brass. Your difficulty is that you have too light a brass deposit. Give a heavier one and you will have no trouble.

QUESTION No. 1212. What do you consider a good formula for a silver plating solution to be used on flat-ware?

Answer. The following is used in many large establishments for flat-ware wark and is excellent:

Water	1 gallon
Silver	3 oz.
Free Cyanide	3 oz.

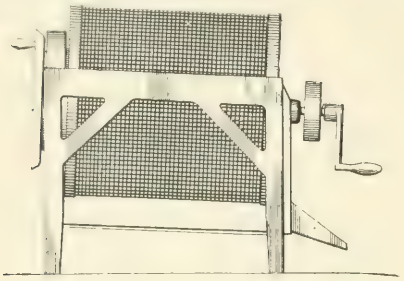
The silver may be converted into either the chloride or the cyanide, and the 3 oz. of metallic silver is the amount used for the start. If chloride of silver is used for the beginning, take 4 oz. as this substance contains three-quarters of its weight of metallic silver.

QUESTION No. 1213. Can the metal or alloy used for making the so-called "die-castings" be cast in sand? I have some castings to make of this metal to go with some that were made in metal molds and will be obliged to make them in green sand if I make them at all.

Answer. You will be able to make the castings of the die-casting metal in green sand. It consists of zinc, copper and aluminum, or zinc, tin copper and aluminum, or similar mixtures and the zinc is the base. The aluminum in the mixture will enable you to make good sand castings and it is being done every day. The surface, of course, will not be as smooth as that obtained in the metal molds

Patent Abstracts.

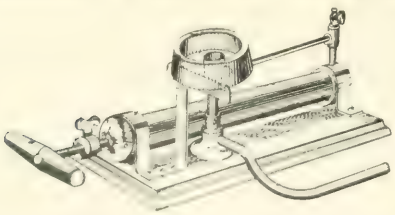
1,037,371, Sept. 3, 1912. SAND SIFTER. Henry Tscherning of Freeport, Ill. Assignor to the Arcade Mfg. Co., of the same place. A device for sifting sand by hand. It is intended



primarily for use in foundries and to render the sifting of sand easier than by means of the ordinary hand riddle.

1,039,672, Sept. 24, 1912. COMPOUND OR COMPOSITION OF MATTER AND METHOD OF PRODUCING SAME. Auguste J. Rossi and William F. Meredith of New York. Assignors to the Titanium Alloy Co. of Niagara Falls, N. Y. A new alloy consisting of 80 per cent or more of titanium carbide and 5 or more of another metal, such as copper. The use of this material for purifying and alloying with other metals is stated as the use to be made for it.

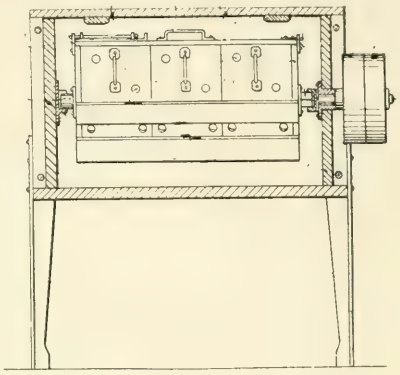
1,038,063, Sept. 10, 1912. CASTING DEVICE FOR DENTAL PURPOSES. J. F. Alexander and W. G. Alexander of Seattle, Washington. A device for casting small



amounts of metal under pressure in a plaster or similar mold. A vacuum is employed for exhausting the mold and pressure applied to the metal also.

1,037,010, Aug. 27, 1912. PROCESS OF MANUFACTURING ALKALI CYANIDES. James Alfred Kendall of Streatham, London, England. Nitrogen, potassium or sodium hydroxide and carbon are brought together at a suitable temperature in a nickel or cobalt retort. Potassium or sodium cyanide is formed and distills and is caught in a condensing head.

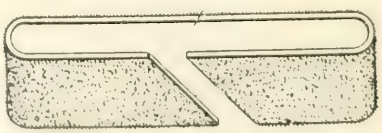
1,038,791, Sept. 17, 1912. TUMBLING AND POLISHING MACHINE. Henry B. Richardson of Attleboro, Mass. A tumbling barrel for use in tumbling small metal articles. The barrel may be used with any abrasive material, with soap or other cleaning compound, or with steel balls for burnishing metal goods by tumbling. The barrel is hexagon shaped



and is used horizontally. The barrel is an improvement over that previously made by the inventor and the new features are in the manner of locking the cover, revolving the barrel, and the charging opening. The barrel revolves in a tank in which various solutions may be placed as desired.

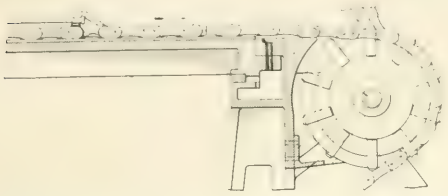
1,039,463, Sept. 24, 1912. ELECTRICAL RESISTANCE. Elihu Thompson of Swampscott, Mass. Assignor to the General Electric Co., of Schenectady, N. Y. The resistance consists of a mass of fused silicon impregnated with quartz. It is stated that fused silicon has the property of "wetting" and permeating quartz so that an approximately homogeneous mass is produced.

1,037,582, Sept. 3, 1912. JOINING ABRASIVE SHEETS. Emile J. Bein of Newark, N. J. A method of joining emery belts used on strapping and similar machines. A piece



is put under the joint cut diagonally, and the surface then "grained" by pressing a piece of wire cloth against the joint when made. This serves to make the joint uniform with the rest of the surface.

1,036,641, Aug. 27, 1912. SAFETY LINK FOR DRAW-BENCH CHAINS. William W. Kennedy of Wheeling, W. Va. Assignor to the National Tube Company of Pittsburgh, Pa. An appliance for use on draw benches



employed in drawing tubes or rods. The link which operate the tongs is so constructed that they are released when the tube is drawn through the die. That is they are released automatically.

1,036,996, Aug. 27, 1912. ELECTRIC INDUCTION FURNACE. Albert E. Greene of Chicago, Ill. Assignor to the American Electric Smelting & Engineering Co. of St. Louis, Mo. A method of operating an induction furnace from a three phase line of ordinary voltage, while only two phases operate in the furnace. Also a means for operating the furnace without unbalancing the three phase power supply.

1,037,213, Sept. 3, 1912. EXTRUSION PRESS. Louis Georges Derain of Boulogne-Sur-Seine, near Paris, France. A machine for making tubes and rods by forcing hot metal through a die. The essential feature

of the press is in the improvement made upon it so that the entire billet of metal can be forced through the die, leaving the latter clear for another operation and preventing waste of metal in the shape of a sprue or end piece.

1,036,719, Aug. 27, 1912. POLISHING MACHINE. Henry Robinson of Newark, N. J. A machine for use with hand or power and for cleaning, scouring and polishing table knives. This is accomplished by two abrasive wheels set at an angle.

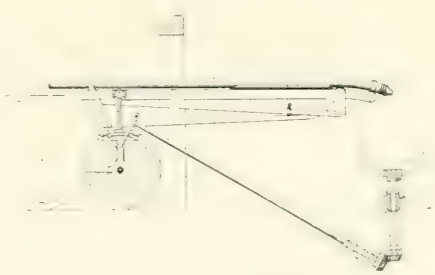
1,039,036, Sept. 17, 1912. BLOWPIPE. Melbourne K. Dunham of Brookline, Mass. A blowpipe to be used for oxy-acetylene or similar form of welding. The burner is so designed that danger of a blow-back is eliminated. There is also a device for keeping the handle of the blowpipe cool.

1,037,719, Sept. 3, 1912. VARNISH. Leo. H. Baekeland of Yonkers, N. Y. Assignor to the General Bakelite Co., of New York. A varnish made by dissolving Bakelite in a solvent. This solvent may be a number of materials that dissolve Bakelite and evaporate readily. The varnish may also be mixed with other materials like pyroxylin, resins etc. to modify its properties.

1,038,694, Sept. 17, 1912. POLISHING CLOTH. Harry S. Webster, of Toledo, Ohio. A cloth for polishing metal. It is impregnated with a water proofing material and with chalk and rotten stone as the polishing material. The object of the waterproofing material is to allow rinsing the cloth without destroying its polishing qualities.

1,037,913, Aug. 27, 1912. APPARATUS FOR DRYING MOLDS. James Alfred Jones of Chicago, Ill. A burner for use in drying iron molds used in casting metal for rolling. The burner is applied more particularly to molds for steel and for heating the molds, as it has been shown that a warm or hot hold gives a better casting than one that is cold.

1,037,760, Sept. 3, 1912. SAND BLASTING APPARATUS. Harvey B. Heaslet of New Brighton, Pa. A method protecting a sand-blast operator from being struck by particles of sand which fly off when the sand strikes



an object. It is intended to avoid the use of a helmet upon such an operator. The idea is carried out by interposing a shield between the operator and the article being sand-blasted.

1,037,469, Sept. 3, 1912. PROCESS OF METALLIZING ELECTROTYPE MOLDS. Hyman Eli Goldberg, of Chicago, Ill. A method of rendering an electrotype mold of wax or gutta-percha a conductor. The face of the mold is sprayed or painted with an emulsion of copper powder or graphite in a material of a liquid nature that will "wet" the surface. This cannot be done by water. The liquid used is either benzol or ether

Trade Items.

The City Brass Foundry, 5323 St. Clair Ave., Cleveland, Ohio, are to erect a new machine shop. This will be 50x116 feet and two stories high.

The Mark Cross Company, 210 Fifth Ave., New York City, manufacturers of leather, metal novelties and art goods, have moved their factory from 137 East 25th St., New York City to Creek and Meadow Sts., Long Island City, New York.

The Eclipse Air Brush & Compressor Company, the well known manufacturers of air brushes and compressors for applying lacquers by the spraying process, have moved their factory and office from Bloomfield, N. J. to 216 High St., Newark, N. J. where larger and more accessible quarters have been obtained.

The plant of the Vancouver Brass Co., 755 Keefer St., Vancouver, British Columbia, which burned down a few weeks ago, will be rebuilt and business continued. This company conduct a jobbing brass foundry and make a specialty of ornamental brass work. Electroplating and polishing are also carried on for the trade.

The Victoria Safe & Lock Company of Victoria, Texas, manufacturers of safes, steel cabinets and similar goods, are to install a small electroplating plant for carrying on their own work. They state that they have found it difficult to obtain satisfactory work outside in their section and have found it imperative to start their own plant.

The Jonathan Bartley Crucible Co., Trenton, N. J., manufacturers of graphite crucibles and graphite products, had an exceptionally creditable exhibit at the Foundrymens' Convention in Buffalo. Nearly all the sales force were present and looked after the interest of their customers in a careful manner. The company distributed a souvenir in the shape of a decorated stone mug and which proved to be the most popular and attractive souvenir at the convention.

The Damard Lacquer Co., 1170 Broadway, New York City, have placed upon the market something new in the line of lacquers. There has been a demand for a lacquer which would stand on such work as brass beds, and similar goods, and the "Damard" lacquers were put upon the American market to satisfy this demand. The lacquer, while new in this country, has been in use for seven years in England and has stood the test of time and the severe usage on brass bedsteads. As an indication of the durability and quality of the lacquer, it is stated that a one inch brass tube, coated with the lacquer, was hammered so that dented, but the lacquer did not crack or peel. Another test is that alcohol, while removing ordinary bedstead lacquers, does not attack the Damard coating on metals. Samples of the lacquer will be submitted and experimental orders solicited.

The Union Hardware Company of Torrington, Conn., are to build an addition that is to be used as a plating department.

The Boston Electric Show has opened in Boston, Mass., and will continue until October 26th. It is stated by the management that the displays and volume of exhibits will exceed those of any previous years.

The New Britain Machine Company of New Britain, Conn., manufacturers of hardware, polishing machines and other similar goods, are to increase their capital stock from $450,000 to $600,000. The increase of their business has made this necessary.

R. Wallace & Sons, Wallingford, Conn., manufacturers of sterling-silver and silver plated flat-ware and hollow-ware, are to enlarge their melting room and roll room. Additional oil melting furnaces are to be installed and larger rolls will be used in rolling the sterling-silver from which their goods are made.

The Joseph Dixon Crucible Company of Jersey City had their usual attractive and interesting exhibit at the Buffalo Foundrymens' Convention. Nearly all of the crucible sales force were present and the booth of the company proved to be the Mecca of many brass founders. The demonstration which was given of the cause of "alligator cracks" on the surface of the graphite crucibles was quite novel and proved of great interest to those who saw it.

The increase in the price of platinum has made it necessary for manufacturers of electrical goods to economize to the greatest possible extent, and at the same time it is impossible to dispense with platinum. The Commercial-Research Company, Lake Ave., Tuckahoe, N. Y. manufacture "Comreco" rivets for use as platinum contacts. These consist of a nickel shank with a platinum contact surface welded on. In this manner it is possible to obtain a heavy rivet at a low price, and at the same time have all the qualifications of a solid platinum rivet.

The Southern Aluminum Co., recently incorporated under the laws of New York State with a capital stock of $6,000,000 to smelt aluminum and who are now erecting a plant in Whitney, North Carolina, recently elected the following directors: Adrien Baden, Leon Bartholin, George Berges, Hippalyte Bouchayor, Henry Brunner, Charles Dubreuil, Jules and Charles Michael-Cote of Paris, France; Hubert Chalmeton de Croy of Lovret, France, Henry Gall of Versailles, France; Jean Sonnery Martin and Lazarre Wolf of Lyons, France; Zachery Hochschild of Frankfurt-on-the Main, Germany and Dr. Paul Heroult, the noted electric furnace inventor, of New York City. The company has obtained charter to manufacture aluminum and its by-products.

A new building is being erected by the Electric Cable Co., of Bridgeport, Conn., and which will be used for the manufacture of lead covered copper cable. Lead presses will be installed as soon as the building has been completed.

A foundry is to be erected by the Jackson Ornamental Iron & Bronze Works, of Jackson, Tenn., and in which all their own castings will be made. The equipment has practically been purchased. A travelling crane will be installed.

The Roessler & Hasslacher Chemical Company, 100 William St., New York City, exhibited their "Trisalyte" plating salts at the Buffalo Foundrymens' Convention and the exhibit and the trade was looked after by Mr. Carl Dittmar and Mr. William Schneider of the company.

I. M. Jacobson & Sons has been formed in Detroit, Mich. for dealing in metals and alloys. Strictly virgin metals will be handled and all metal alloys. The firm is composed of I. M. Jacobson, Mark Jacobson and Harry Jacobson. The offices are at 408 Ford Building. Their alloys are all manufactured in Detroit and the quality is guaranteed. They are in a position to make attractive proposals to consumers.

The J. W. Paxson Company, Philadelphia, Pa., the well known manufacturers of foundry supplies and equipment, have just issued a new and very attractive catalogue of the "Paxson-Warren" sand blast machinery and appliances. Many new and novel sand-blast devices are listed and illustrated in this catalogue and those interested in the sand blast will find it of much interest. The machinery described is up to date in every respect and much of it is entirely new.

The Bay State Silver Co., has been incorporated in Taunton, Mass., with a capital stock of $35,000 to manufacture silver ware. The directors are Charles Fisher, Robert C. Bennett and Thomas P. Carrol. Charles Fisher is the president of the company. Mr. Carrol was formerly a plated silver-ware manufacturer of Taunton, and Mr. Fisher was formerly manager of the stores of F. W. Woolworth, the well known five and ten cent store merchant.

A contract for a plant has been awarded by the Southern Aluminum Company to the General Electric Co., and it will be erected at Whitney, North Carolina. The electrical equipment, for which this comtract has been awarded, is to cost $400,000. Some 40,000 horse power will be needed. The whole development is to cost $10,000,000 and it is expected that the plant will be in operation by June of next year. The engineer of the company is Dr. Paul Heroult, 149 Broadway, New York City and who is an authority on the reduction of aluminum. Dr. Heroult was one of the pioneers in the aluminum industry and has made many valuable discoveries in this field as well as in the electric furnace line.

D. S. Plumb, East Park St., Newark, N. J., manufacturer of clock movements is to erect a three story factory building at Norfolk & Dickerson St., at a cost of $28,000. Permit for this building has just been granted.

A factory is to be built by the Silversmiths' Company, Ltd., at New Hamburg, Ont., Canada. The cost of the factory, it is stated, will be about $75,000 and about 100 hands are to be employed.

Edward L. King has been appointed permanent receiver of the Pratt & Cady Company of Hartford, Conn., manufacturers of valves and who recently went into a receivers hands. It is expected that the receivership will be only temporary and that business will be continued as usual.

The Springfield Facing Company of Springfield, Mass., manufacturers of foundry facings, have incorporated their company with a capital stock of $40,000. The manufacture of foundry facings and supplies is carried on. Lyman S. Brown and Philip H. Remington are the incorporators.

The Otis Bed Mfg. Co., has been incorporated in Buffalo, N. Y. with a capital stock of $50,000 to manufacture brass and iron beds and has taken over the business of the same character formerly conducted by the George A. Otis Company at 818 Main St. The directors of the new company are, President, Harvey A. Chadwick; and John Meyer, N. Orisini de Bock and David Ruslander.

A brass foundry has been started by the L. C. Smith Company at 225 John St., Bridgeport, Conn. A special non-corrosive bronze is to be made and which will be cast at this place in bars and billets for rolling into sheet. The foundry is not yet in operation and the equipment is being installed. The company recently moved to this city from New York.

The Brown Instrument Company, and its associate company, the Keystone Electrical Instrument Co., have found it necessary to arrange for tripling the amount of space after the 1st. of the year than they now occupy. These two companies have found a very large increase this year in the demand for their Pyrometers, Thermometers and Electrical Instruments, and an increase in their factory is necessary to meet with their constantly growing business.

A plant is being erected by the Quigley Foundry & Furnace Co., at Chicopee, Mass. This company was recently organized by W. S. Quigley, formerly of the Rockwell Furnace Co., of New York City. Gray iron castings will be made and the manufacture of furnaces for melting, annealing and tempering carried on. The officers are: President, C. K. Lassiter of Richmond, Va., and who is superintendent of the plant of the American Locomotive Co., Vice-President, W. S. Quigley, P. R. Ramp formerly superintendent of the Murray Iron Works of West Burlington, Iowa, is the general superintendent. The office of the company is at 50 Church St., New York, and from which sales will be made.

Moses Einstein of Providence, R. I., manufacturer of plated chains, has moved to his new factory at 153 Bluff Ave., Edgewood. New equipment for manufacturing has been added.

The business and plant of the Charles A. Bennett Co., of Taunton, Mass., manufacturers of silver plated wares has been sold to parties in New Milford, Conn., who will move it to that place and start manufacturing again. It is stated that Charles A. Bennett will manage the new company.

The De Long Hook & Eye Co., of Philadelphia, Pa., manufacturers of hooks and eyes and similar small metal goods, are to start a Canadian factory and the De Long Hook & Eye Co., of Canada has been organized for this purpose. The factory will be located in St. Marys, Ont. The directors are Edwin G. Long, Anthony L. Malone and Albert Meavins.

The Cameron Company has been incorporated in Beverly, Mass., to take over the business of the Cameron Car Co., of that place, manufacturers of automobiles. The company has purchased the machinery and equipment of the Pickard Bros. Motor Car Co., of Brockton, Mass. It is stated that 1000 cars will be manufactured in 1913.

The *University Press* of the University of Tennessee, Knoxville, Tenn., has issued the 17th. Edition of their "Manual for Engineers." This is a little book full of valuable and useful information and of vest-pocket size. The book is intended for a mechanical engineers' pocket book and contains much information not found elsewhere. The book has been compiled by Chas. E. Ferris, B. S. Professor of Mechanical Engineering in the University.

The exhibit of the Electric Smelting & Aluminum Company of Lockport, N. Y. at the Buffalo Foundrymen's Convention was quite extensive and consisted of a full line of their products. The various bronzes which they make were shown in ingot form, as well as pure aluminum and its alloys, babbitt-metals, solders and numerous special alloys. They also exhibited their now celebrated "Mineral Cleaner" which has met with such excellent reception by the electroplating trade. This compound contains no greases or oils and does not tarnish or stain polished brass or copper work.

The Anthony Company, 9 Jackson Ave., Long Island City, New York, liquid fuel engineers, have just issued their new catalogue of their furnaces, burners and oil equipment. This describes the "Anthony" furnace and which has been upon the market for some time with excellent results. The furnace has recently been greatly improved and, as in the past, the "Anthony" low pressure burner is used. The advantage of this burner is indicated by the illustrations of ten crucibles upon the front of the cover of the catalogue. These crucibles showed as high as 68 heats, and the lowest was 51 heats. The appearance of the crucibles was then good. This catalogue will be sent to anyone interested.

The Lunkenheimer Company of Cincinnati, Ohio, manufacturers of valves and other steam specialties, are to erect a new foundry at their plant in West Fairmount. The foundry will contain the latest and most approved foundry equipment.

It is stated that J. A. Roebling Sons Co., of Trenton, N. J., who purchased the copper rolling mill of the Tamarack & Osceola Company at Dollar Bay, Mich., will remodel the mill and run it. Copper wire and sheet are manufactured there and the mill is one of the oldest in the United States.

The John Davenport Company, 98 Foundry St., Stamford, Conn., manufacturers of piano hardware, are to start a brass foundry at their plant. This company succeeded the Davenport and Tracey Co., who conducted the business for many years. Benjamin Ogden is general manager of the company.

The novelty business of W. B. Marble & Co., of Attleboro, Mass., has been purchased by John J. Nichols of Taunton, Mass., and has been moved to the latter city. The site of the old Globe Nail Company's building has been obtained and is being remodled. Sterling silver novelties are to be manufactured.

The H. M. Lane Co., has been organized in Detroit, Mich., by H. M. Lane, formerly editor of *Castings*, and Olin F. Flumerfelt. The company will conduct a testing laboratory and will specialize on foundry and metallurgical work. Core testing will be carried on. The office and laboratory of the company is at 18 Piquette Ave., East, in that city.

The Keyless Lock Co., of Indianapolis, Ind., manufacturers of locks and who are to erect a new factory in that city at a cost of $75,000, will install oil furnaces for melting brass in their foundry when equipped. Aluminum will also be melted. The company will manufacture brass and aluminum automobile castings. The new plant will be situated at Sheldon St., and Union Railway.

The Monarch Engineering & Mfg. Co., of Baltimore, Md., manufacturers of the "Steele-Harvey" furnace for melting metals of all kinds, had an extensive exhibit at the Foundrymens' Convention held in Buffalo, Sept. 23rd.-27th. The entire line of their products were shown, including melting furnaces both of the crucible tilting and stationary types, and reverberatory furnaces. A small furnace of the reverberatory type is now made by them and is very useful for some classes of work.

At the meeting of the National Association of Brass Manufacturers, held in Toronto, Ont. on September 10th and 11th, some plumbers' brass goods were standardized and the weight of standard goods specified. For example, a ½-in. I. P. compression bibb was standardized at 13 oz. A number of other goods were likewise standardized. It is expected at the next meeting to be held in New York City, that threads will be made uniform. This association is composed of manufacturers of plumbers' brass goods.

The Louisville-Vulcan Smelting Co., scrap-metal smelters, have purchased land at Waukegan, Ill., upon which an addition to their plant will be erected.

The so-called burner shop of the Bristol Brass Company at Forestville, Conn., has been acquired by the National Marine Lamp Co., of New York City and will continue manufacturing at the plant.

A new company, called the E. S. Bryant Pattern Company, has taken over the Bryant & Berry Co., of Detroit, Mich., brass founders and pattern makers. The new company has been capitilized at $2,000.

The plant of the Glauber Brass Company of Cleveland, Ohio, manufacturers of plumbers' brass goods, is shortly to be enlarged. This will consist of a two story brick building, 20x100 feet.

The Titanium Alloy Company of Niagara Falls, N. Y. smelters of titanium alloys, have found it necessary to install some new automobile trucks for use in transporting their products.

A new plant is to be erected by the Michigan Cash Register Company of Detroit, Mich. This plant is to be located at Fifth and Porter Sts., and will be four stories high and 138x150 feet. It is expected that the plant will be ready for occupancy on January 1st.

The W. S. Rockwell Company, 50 Church St., New York City, furnace engineers, have recently issued their catalogue No. 15, describing their rotary annealing and hardening furnaces. This catalogue contains many illustrations of their furnaces and much interesting matter regarding them.

The Humphreys Mfg. Co., of Mansfield, Ohio, manufacturers of iron and brass pumps, and plumbers' brass goods, have gone into the hands of a receiver and S. N. Ford and Reid Carpenter have been appointed to this office. The business is being continued, but it is yet unknown whether it can be continued permanently so that it can be taken out of the receivers hands. Most of the creditors are local parties.

At the meeting of the National Association of Brass Manufacturers, held in Toronto, Ont. during the month of Sept., a novel method of getting members to attend meetings was suggested and which, it is stated, will be carried out at the next meeting to be held in New York City. A reward of $10 will be paid to each member attending the meeting. This is made possible on account of the flourishing condition of the association.

It is reported that the Electric Smelting & Aluminum Co., of Lockport, N. Y. is to erect a plant in Sewaren, N. J. for the smelting of aluminum from the ore. This is to be done after a process recently developed by Alfred H. Cowles and Adolf Kayser. It is reported that clay will be used as the ore and that the process is very cheap so that aluminum can be produced for several cents a pound less than the present market price.

An addition to the plant of the Chamberlain Cartridge & Target Company at Findlay, Ohio will shortly be built.

The plant of the F. H. Burns Company of Brooklyn, N. Y., manufacturers of jewelry is to be moved to Belmont, N. Y. About 150 hands, it is stated, will be employed.

Owing to the fact that a larger plant than first intended is to be built by the new Baltimore Tube Company, Baltimore, Md., there has been some delay. The original plans have been increased 50 per cent, and this necessitates additional purchase of machinery. A brass foundry, it is stated, will also be built. Charles S. Morse, the well known brass rolling mill expert, has taken charge of the plant.

Personal.

George Holden, superintendent of the Greenpoint Metallic Bed Company and the Hospital Supply Co., both of Brooklyn, N. Y., has resigned his position and will take up production and consulting engineering work.

Charles S. Morse, formerly general superintendent of the brass mill of the National Conduit & Cable Co., Hastings-on-Hudson, N. Y., has been appointed general superintendent of the new plant of the Baltimore Tube Company, Bayard St., Baltimore, Md. This plant will shortly be completed.

John J. Burke of Brooklyn, N. Y., formerly in charge of the plating department of the Waldorf-Astoria Hotel in New York City, is now with the Roessler & Haaslacher Chemical Co., 100 William St., New York City in the capacity of salesman and demonstrator for the Trisalyte department.

Victor C. Lassen, superintendent of the plants of the Vanadium Metals Co., at Groton, Conn., and East Braintree, Mass., has resigned his position with this company. Mr. Lassen was the founder and general manager of the Victor Metals Company of East Braintree, Mass., and which was merged into the Vanadium Metals Co., some time ago.

Obituary.

William H. Gallison, president of the Boston Brass Co., of Boston, Mass., died on Sept. 5th.

William H. Corbin, vice-president and counsel for the Joseph Dixon Crucible Co., of Jersey City, N. J., died on September 25th.

Edwin C. S. Hunt, of the sales department of the Hoyt Metal Company of St. Louis, Mo., died on Sept. 10th, aged 57 years. He was a native of Bristol, England.

George W. Wells, founder and president of the American Optical Co., of Southbridge, Mass., died on Sept. 30th. aged 66 years Starting with the company when organized in 1869, he was instrumental in building it up to its present magnitude as the largest concern of its kind in the United States.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.26
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia, 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.10⅛
Arsenic, Metallic	lb.	.10
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.50
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitrol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.10
Chrome-Green	lb.	.50
Copper, Lake (carload)	lb.	.17¾
Copper, Lake, (cask)	lb.	.18
Copper, Electrolytic, (cask)	lb.	.17⅝
Copper, Electrolytic, (carload)	lb.	.17⅜
Copper, Casting, (carload)	lb.	.17½
Copper, Casting, (cask)	lb.	.17¾
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F A F F F	lb.	.03
Flint, powdered	lb.	.01
Flour Spar	lb.	.01¼
Fuel Oil	gal.	3.50
Gold Chloride	oz.	11.75
Gold, Pure	oz.	20.87
Gum Copal	lb.	.30
Gum Guaiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandrac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum shellac, white	lb.	.60
Gypsum	oz.	03.50
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.05⅛
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	1.16
Mercury, Metallic (Quicksilver)	lb.	.42
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.45
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Satpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Cloride	oz.	23.00
Platinum Metallic	oz.	45.50
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic	lb.	.05½
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.08
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.64
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.50½
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc, Carbonate, dry	lb.	.19
Zinc, Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, spelter	lb.	07.5

THE BRASS WORLD AND PLATERS' GUIDE

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Contents for November.

Aluminum, Metallic, in Ingots ..... lb.	.28
Aluminum, Compound for Machining	395
Brass, Oxygen in	394
Brass Alloy Containing Silicon, Strong	390
Brass and Bronze Plating Solutions	397
Brass, New Method of Making	388
Core-Flour, Adulteration of	392
Copper Solution, How to Add Carbonate of Copper to	386
Coinage Alloys, Annealing of	404
Compound Copper and Steel Billet	395
Drying-Out Machine, Centrifugal	393
Electrogalvanizing Solution, Improved	403
Electric Furnace Question, The	386
Gun-Metal Casting, a Large	383
Gun-Metal, Use of Nickel in Increasing Strength of	402
Glass, Porcelain, etc. Depositing Metals on	402
Melting of Brass and Copper, Electric	387
Molds for Casting Brass, Surface of	381
Nickel Salts, The "Royal"	396
Nickel Deposits, Thick	391
Nickel Plating Electrogalvanized Articles	385
Ovals and Circles, Machine for Cutting	403
Pyrometer, Continuous Chart Recording	399
Silvering Dip, Improved	398
Silver Finish, New, White	394
Sodium Cyanide in Electroplating	404
Silver Nitrate in Plating Solutions	382
Skim-Gate with Perforated Core	389
Silver Plate, British Standard of	405
Tin on Tin Cans, Difficulty of Reclaiming	385
Tin-Foil, Use of Aluminum in Place of	396
Vanadium in Casting German-Silver	392
Wastes Occurring in Brass Manufacture, etc.	399
Zinc from Galvanized Scrap, Recovering	403

The Surface of Iron Molds for Casting Brass for Rolling.

Iron molds are invariably used for casting brass to be rolled into sheet or drawn into wire. The same is true for casting tube shells from which seamless tubing is made. There is always an undercurrent of opinion, particularly among those who have had little experience in the brass rolling mill line, that these molds should be planed. That is the surface of the mold, with which the brass comes in contact should be made smooth by planing. It is not surprising that this belief should exist as one would naturally think that a smooth mold would give a smooth casting. So it will under certain conditions, but in casting brass for rolling the condition is one quite different.

To be sure, good castings can be obtained in planed molds and they are used, but theoretically it is not the best surface although when poor iron castings are obtained, it may be absolutely necessary to plane them in order to render them usable. Rolling mills, however, do not use such castings.

In casting brass for rolling, it is necessary to coat the surface of the mold with oil, and it is the use of this oil that necessitates a surface on the casting that will hold it. If the surface has been planed, then the oil does not adhere to it well, but runs down to the bottom of the mold. The result, therefore, is that there is not enough oil on the surface of the mold and too much in the bottom, so that it then happens that a casting made in it will not be good at the bottom, and the surface itself will not be quite satisfactory.

The function of the oil on the mold is two-fold:

It prevents the brass from adhering to the mold.

It acts as a reducing agent and reduces oxides that form during the pouring and when the molten brass or other metal comes in contact with the air. This function of the oil is the more important and indeed, it determines whether good or bad brass can be made. If no oil at all is used on the mold, the surface of the brass casting produced is not good and it is apt to contain considerable oxide. This causes what is known as "spills" and the sheet brass will contain minute imperfections in the form of slivers and streaks, caused by the presence of oxides and which produce minute cracks in the metal. The oxide intermingled with the brass, acts like so much dirt, and when the metal is rolled, it splits at such a point.

It will readily be appreciated, therefore, that too smooth a surface on the mold is not right for it will hold but the merest film of oil. On the other hand, a surface too rough will produce a rough casting.

It has been found that the ideal surface on a mold is one that is slightly rough and which is best termed as "velvety". This surface can be produced by a sand-blast or by pickling the iron casting. It will then hold just enough oil to act beneficially in the casting of the brass, and yet a good surface will be produced on the casting and one that will not be rough. In this connection it should be borne in mind that a smooth surface on the brass casting is unnecessary as it is rolled and generally scraped previous to this so that any slight roughness is rolled out.

Using Nitrate of Silver in Silver Plating Solutions.

It is generally believed that nitrates are very injurious when present in a silver plating solution, but such belief is wrong. Not only can silver be plated from a solution containing them but the silver deposit, as far as can be seen, is as good as when the chloride of silver is employed. The fact that the nitrate of silver can be used, has been brought to the notice of the electroplating industry by the fact that many of the manufacturers of silver deposit wares use the nitrate in making up their baths. In addition to this, it has been found that there are a number of large manufacturers who have never used anything else but the nitrate of silver in making up their silver plating solutions, and the work they turn out seems to be excellent.

The use of nitrate of silver in making up a silver plating solution was first proposed and used by Roseleur and it is to him, no doubt, that credit of the use of the nitrate at the present time belongs.

When used, the nitrate of silver is simply dissolved in cyanide the same as the chloride or the cyanide of silver would be used and the solution employed in the regular manner. The fact that the nitrate of silver can be used and is actually being used in silver plating is cited to indicate how some erroneous beliefs become firmly rooted in the plating trade. Many of the silver platers have said that the nitrate cannot be used. The fact remains that it is used and the results are good. The excuse for using it, however, is one of adaptability. It can be purchased or made without difficulty, and were the chloride or the cyanide as easily made, the nitrate would undoubtedly not be used.

Now comes the question: Is it advisable to use the nitrate of silver in preference to the chloride of the cyanide?

It can be used, and is being used, but theoretically the cyanide is preferable. When the nitrate is used and dissolved in potassium cyanide, potassium nitrate is formed which remains in the solution as an inert salt. And subsequent additions serve to increase this quantity of potassium nitrate. The same is true with the chloride of silver. Potassium chloride is formed and when the chloride of silver is added from time to time to build up the solution, more potassium chloride is formed. In this manner the solution becomes filled with inert salts. These, it has been proved, do no harm, but the solution has a shorter life. Possibly these inert salts may serve as conducting salts. This point is unknown.

The verdict of silver platers seems to be that silver cyanide is preferable to any other silver salt for making up a silver plating solution. The results are excellent and no inert or injurious salts are introduced in the bath. The difficulty of making the silver cyanide is the reason for its limited use, but its employment seems to be growing.

As far as the silver nitrate is concerned, it is believed that it is just as good as silver chloride. In the one case, potassium nitrate is formed and remains as an inert salt in the solution, and in the other potassium chloride Which is the more harmful?

A Large Gun-Metal Casting Recently Made at the Works of the Whitlock Coil Pipe Company, Hartford, Conn.

Large castings are invariably of interest to the brass founder and there is always a certain amount of pride in the matter as far as the maker of the casting is concerned. A large casting was recently made by the Whitlock Coil Pipe Company of Hartford, Conn., in their brass foundry which is of interest to the trade in general. It is of interest for several reasons: First it is a large and difficult casting. Second, it possesses high physical qualities as will afterwards be noted. Third, it is to be used on the Panama Canal.

The casting herewith shown was made by the company for the Pelton Water Wheel Company who are to use it in constructing a wheel for our Government to be used at the Panama Canal. The casting was required to conform to the Government specifications.

The metal specified was the well known and excellent mixture 88-10-2 which, as well known consists of 88 parts of copper, 10 parts of tin and 2 parts of zinc. It is known as Government bronze. The casting was required to conform to this specification on chemical analysis.

The casting with the gates and runners weighs nearly 7,500 lbs. and to pour it practically 10,000 lbs. of metal were needed. Dry sand cores were used for making the vanes as shown in the illustration and these weighed nearly 600 lbs. each so that it was necessary to handle them with a crane. The setting of these cores was, therefore, a delicate and lengthy job as all the vanes, as well as the other portions of the casting were required to be of uniform thickness. No deviation from the drawings supplied by the customer was allowed. These cores were coated with graphite to prevent any adherence of the sand and to produce a smooth casting. When assembled

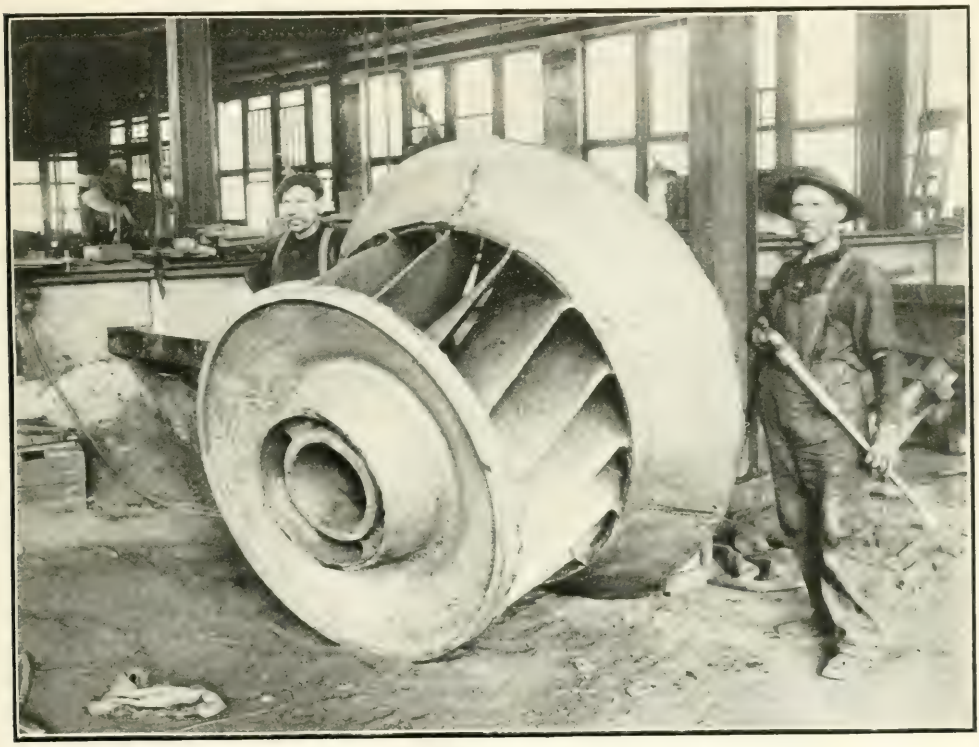


Fig. 1. Large Gun-Metal Casting Made by the Whitlock Coil Pipe Co. of Hartford, Conn. for Panama Canal.

they were held together with adjustable iron bands to prevent slipping. The casting owing to the use of graphite on the mold had a very smooth surface.

The flask used was of cast-iron 8 feet in diameter and built up in 1 foot sections which were bolted together. The lowest section was bolted to an iron plate and this was carefully bedded in the floor of the brass foundry. This work had to be carefully carried out on account of the pressure of the metal on the bottom of the flask. Owing to the size of the casting, the pressure of the metal with so high a pouring head was great and careful work was required to prevent any "run-out" of the bronze when being poured.

The metal was melted in the usual manner under charcoal and then emptied into the large ladle from which it was poured into the mold. Each while being emptied into this ladle, the surface was kept covered with the charcoal in order to prevent oxidation.

In pouring the mold, a basin and four gates were used. These were plugged and kept so until the basin was full of metal, when the plugs were drawn and the metal allowed to run into the mold. These basins were then kept full of metal while the mold was filling and it was possible, therefore, to prevent the entrance of foreign matter, such as dross, charcoal or slag.

The pouring of the casting was done by one 3 ton ladle, handled by a 5 ton travelling crane, and two 1 ton ladles served by jib cranes.

The following physical characteristics were obtained upon coupons made on the casting. It may be of interest to state that these wheels were cast under the specifications of the Bureau of Steam Engineering, and which requires the following results of the test bars:

Tensile Strength ..... 30,000 lbs. sq. in.
Elastic Limit ..... 15,000 lbs. sq. in.
Elongation ..... 15% in 2 in.

The following tests were obtained on the castings and which it will readily be appreciated conform to the specifications:

BRONZE TEST SPECIMEN

Dimension ..... 0.505 in. diameter

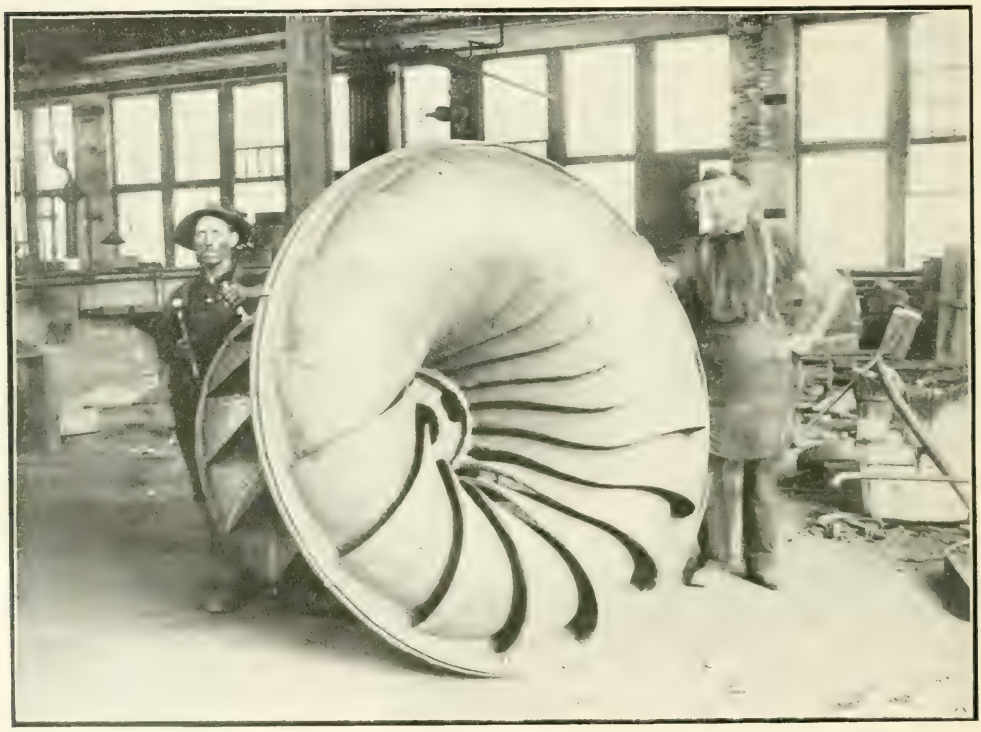


Fig. 2. Another View of the Same Casting Shown in Fig. 1.

Area ..... 0.200 sq. in.
Reduced Dimensions .... 0.465 in.
Reduced Area ..... 0.170 sq. in.
Reduction of Area 15%
Elastic Limit ..... 4,900 lbs.
Elas. Lim. per sq. in.....24,500 lbs.
Maximum Strength ..... 9,200 lbs.
Tensile Str. per sq. in. ..46,000 lbs.
Elongation in inches .... 0.20-0 .21
Elongation in 2 in..... 20. 5%
Fracture—Crystalline and broke at the fillet.

The other test was made upon a portion of the runner casting and as this is usually poor metal, the high test obtained is worthy of note.

RUNNER CASTING

Dimension ..... 0.505 in. diameter
Area ..... 0.200 sq. in.
Reduced dimensions .... 0.437 in.
Reduced Area ..... 0.150 sq. in.
Reduction of Area 25%
Elastic Limit ..... 5,400 lbs.
Elas. Lim. per sq. in. ..27,000 lbs.
Maximum Strength .... 8,800 lbs.
Ten. Strength sq. in. ....44,000 lbs.
Elongation in inches 0.20--0.16
Elongation in 2 in. 18%
Fracture ..... Crystalline

These tests were made by the Henry Souther Engineering Company of Hartford, Conn., and indicate the high character of the bronze in the castings.

Nickel Plating Electrogalvanized Articles.

According to an English patent recently issued to W. Feuerhake of Frondenberg, Westphalia, Germany, iron or steel articles may be made rust proof, and at the same time have a good finish, by treating them in the following manner:

The iron and steel goods are first electrogalvanized in the usual manner and then a film of copper is deposited on the zinc from a cyanide copper solution. When this has been done, the goods are nickel plated. It is claimed that this method produces an excellent rust-proof finish.

The object of copper plating the zinc deposit before nickel plating is on account of the practical impossibility of plating nickel directly upon zinc. It can be done, but the results are far from satisfactory as a commercial proposition and it is always better to copper the zinc previous to nickeling.

Difficulty of Reclaiming Tin from Old Tin Cans.

The high price of tin has again stimulated the desire to reclaim the tin from old tin cans. It is well known that the tin on the cans is pure and the sheet iron or steel upon which it exists contains about 2 per cent. Therefore, from every 100 lbs. of tin cans, 2 lbs. of tin could be obtained. The proposition, we will admit, appears attractive.

The difficulty encountered in reclaiming the tin from such material is the amount of foreign matter on and in the old cans. Foods, dirt, labels and other foreign material are always present. Many of the cans are lacquered too which interferes unless removed. In order to remove the tin by any process it is first necessary to remove the foreign matter. This must be accomplished by the use of alkalies, such as potash or soda, and heating to burn off the organic matter cannot be employed for the reason that it leaves a coating of carbonaceous matter on the cans that is worse than the matter previous to heating.

It has been found that the cost of removing this foreign matter is so great that the profit is taken from the operation of reclaiming the tin. That is, it has been found so by a number of concerns who have attempted to carry out the process. Cans can be obtained and the tin can be removed from them if quite clean, but there is so much foreign material present in and on the cans that it is usually considered that "it does not pay".

Detinning companies work upon new tin scrap that is perfectly clean and the supply is obtained from concerns who make tin plate goods, such as tin cans, and in some instances by whom they are controlled. It will readily be appreciated that with such a source of clean, tin plate supply, the obtaining of tin is a different problem from reclaiming it from old tin cans.

It is stated by the authority of the Belgian Consul at Yokohama, Japan that the total production of copper in Japan for 1911 was 51,708 long tons, an increase of 2,562 tons over the year 1910. More than half the copper came from the three principal mines: Ashio, Besshi, and Kosaka. The Hidate mine is also making great progress and turned out 5,674 tons in 1911 or more than seven times the amount produced in 1907.

How to Add Carbonate of Copper to a Cyanide Copper Solution.

Cyanide copper plating solutions, particularly when run "hard" and with insufficient anode surface, deposit their copper more rapidly than it is taken from the anodes. The result is that finally the solution becomes so deficient in copper that the electrodeposition is very slow. It then becomes necessary to add copper in some form to the solution and carbonate of copper is the usual material employed for this purpose.

There are two conditions to meet in adding carbonate of copper to a cyanide copper solution:

1. The condition previously mentioned where the copper has been exhausted from the solution.

2. That in which it is desired to strengthen the solution, when it is too low in density. This case does not take into consideration any exhaustion of copper and the solution is supposed to contain the right amount of copper and the right amount of free cyanide per gallon and the only objection to it is that it is too weak. Such a condition, however, is very infrequent and the other case is the one almost entirely encountered.

If the solution that has been run as previously mentioned so that the copper is partially exhausted from it, is to be "built up", the best way is to have a stone-crock or small tank holding a gallon or two, but which can be readily handled. Take out some of the solution to fill it and then add to it a *small* amount of carbonate of copper. Be sure and keep track of the amount of the carbonate of copper used, either by volume or weight. When this has dissolved in the copper solution in the small stone crock (be sure it has all dissolved) try the effect on a piece of work and note the effect on the anode. If the anode remains clean and bright for some time and the copper does not deposit readily, then more carbonate of copper should be added. This can be carried on until the solution works well.

Now by noting the amount of carbonate of copper used for the one or two gallons of the trial solution in the small stone crock, the quantity necessary for the large solution can be readily calculated. For example, if there were used 1 oz. of carbonate of copper for 1 gallon of the solution, then in a 100 gallon solution there would be needed 100 oz. of carbonate of copper or approximately 6 lbs. In this manner the danger of adding too much carbonate of copper or not enough is avoided and an accurate estimate of the amount necessary for the large solution is obtained.

In the other case, the balance between the free cyanide and the copper should be preserved and to strengthen the solution, the carbonate of copper should be dissolved in cyanide previous to adding it just as though a new solution were to be made up.

The Electric Furnace Question.

There is no question that has agitated the brass and other mixed metal trades more than the electric furnace has done during the past year. It is quite natural that the question should be of such interest to those who melt metals as the electric current is so convenient and is so readily controlled that electric melting, like electric lighting and other uses made of electricity, is particularly attractive.

Various forms of electric furnaces are making their appearance upon the market and this, too, serves to stimulate the desire to harness the electric current to the brass foundry.

Investigations, calculations and results of experiments have demonstrated one thing and that is in the matter of cost. To compete with oil melting at the present time, electric current will have to be obtained at a cost less than it can be made except, perhaps, by means of an internal combustion engine or by water power. It has been stated that current will have to be obtained at a price of from 0.40 to 0.80 cents per kilowatt hour in order to compete. This price is very much less than power can be purchased from any city power plant, or can be made by the ordinary method of generating with a generator and steam engine.

The cost of the current, therefore, is such as to preclude the use of the electric current for melting in competition with coal, coke or oil. The field for it, however, is in the manufacture of special alloys or work that cannot be done in the ordinary way. It is probable that the near future will see the electric furnace extensively used in melting metals, but upon special work as it cannot compete in cost with ordinary methods of melting as practiced at the present time.

The Electric Melting of Copper and Brass.*

By G. H. Clamer.†

(At the Buffalo meeting of the American Institute of Metals, C. A. Hansen of the General Electric Co., of Schenectady, N. Y., read a paper entitled "Electric Melting of Copper and Brass", in which some very interesting data was given on costs of electric melting. He stated that in order to compete with oil for melting, electric current would have to sell for 40 to 80 cents per kwh, which is so low that its use would be doubtful.—*Editor.)*

The following is Mr. Clamer's discussion of the paper:

Mr. Hansen's paper on Electric Melting of Copper and Brass, is valuable, because it is based on unbiased data. Furthermore, because it shows an appreciation of the necessity of including in such calculations all items of expense. Calculations of this kind ordinarily do not include the cost of the operation of the blower, for operating the oil burners; and yet when this item is reduced to figures, it will be seen from Mr. Hansen's data, that this is really an item worth considering.

There is another item however, which would probably amount to even more than the cost of operating the blast, i. e. the cost of heating and maintaining in the heated condition, the graphite crucibles into which the metal is transferred from the furnace. If such crucibles are properly heated, they should be at least as hot as the metal charged into them; otherwise, they abstract a great deal of heat from the metal, making it necessary to either overheat the metal in the furnace to allow for this loss in the transfer crucibles; or else allow the metal to become too cold for successfully casting.

Mr. Hansen has calculated the electrical efficiency of the Weeks Furnace, in which runs were made as described in his paper, with a full understanding of the facts. Recently I have noted some published data on electric furnace melting which showed an efficiency considerably above 100%. Such statements are either made in ignorance, or else with a deliberate intention of misleading. I am inclined to believe it is the former, because this matter of furnace efficiency, both theoretical and actual, is a matter not generally understood. As a matter of fact the calculations of actual efficiency, although conscientiously made are frequently misleading. The point which Mr. Hansen has brought forth, i. e. that calculations show that it is more economical to melt in the electric furnace, which is operated by an oil engine, than it is to melt directly by oil, is most interesting. I have recently had occasion to investigate modern oil engines, which are on the market, and in one establishment, where several thousand horse-power is in operation, the total cost of operation, covering a period of one year, has been approximately ½c per K. W. hour Personally I believe, that the future for electric melting in the non-ferrous metal industry, will depend—not so much upon the saving which may be effected in the actual cost of melting as in the savings, which may be effected in diminishing the loss of metal, and in the production of a better product, resulting from the iron contamination with oxidizing and sulphur adding influences. I am firmly of the opinion that many of our failures which we have ascribed to oxygen, are in reality, due to sulphur. I have made some investigations along these lines, and have found that in the most careful crucible melting in coke fired furnaces, that the metal will take up from .02 to .05% sulphur. Copper has the greatest affinity for sulphur of any of our metals, outside of manganese and naturally, it tends to absorb it, if brought into contact with sulphur carrying gases. Sulphur accumulates each time the metal is melted, and this accounts for the dark skin on rerun castings, as compared with those of first melt metal.

Iron and steel are very detrimentally affected by sulphur and if above .04 or 05% sulphur in iron or steel acts so detrimentally, it is only natural to suppose, that even a smaller amount will more seriously affect copper or the copper alloys. It has been fairly well demonstrated that the sulphur in iron and steel exists in it largely as a mechanical impurity, in the form of manganese sulphide. Manganese, as I before stated has a greater affinity for sulphur than has copper, and a very much greater affinity for sulphur than

*Discussion of the paper on "Electric Melting of Copper and Brass by C. A. Hansen, presented at the Buffalo Meeting of the American Institute of Metals.

†Vice-President of the Ajax Metal Co., Philadelphia, Pa.

has iron. It is natural, therefore, to assume that it exists as manganese sulphide.

In the copper alloys on the other hand, we know that if manganese is not present, it is in chemical combination with the copper, and should for this reason, exert a more deleterious influence than it does in iron or steel, outside of course, of the consideration of the influence which sulphur has upon other elements, which are present in iron and steel. There is another field which will make electric furnaces attractive, that is for the melting of all finely divided metal, which cannot be very successfully accomplished in other types of furnaces for reasons well known.

A New Method of Making Brass.

A new method for making brass has been patented by Lawrence Addicks of Chrome, N. J. The process is so interesting that a full description is herewith given:

"The method at present in vogue in manufacturing brass is as follows: In a crucible holding approximately 100 lbs. there is melted a charge of copper and a certain proportion of brass scrap and spelter. The copper having been thus melted, the zinc is introduced, the charge being then skimmed and poured as rapidly as possible, in order to avoid loss of the zinc which volatilizes very rapidly at the temperature of molten copper. This method of manufacture is very expensive, since the cost of the crucibles is high, the depreciation rapid and the breakage very considerable. Moreover, in this method, the brass is produced on a small scale, and the labor cost is excessive. To overcome certain of these disadvantages it has been proposed to make the brass in a reverberatory furnace, but, so far as I am aware, without success. This lack of success is due in the first place to the very great loss of zinc, and, secondly, to the difficulty of maintaining a uniform grade in the brass produced. A uniform grade is necessary, in order to assure a uniform color in the product.

The object of my invention is to overcome the obstacles that have stood in the way of using the reverberatory furnace, or a similar large source of heat, and to produce the brass on a large scale and at a price for labor not much exceeding the casting of copper ingots by the copper founder.

To carry out my invention, I melt in a reverberatory furnace, or similar source of heat, a full charge of copper such as is put into the furnace by the copper melters. The size of these charges varies from 20 to 250 tons per twenty-four hours, and the method is in no way changed from ordinary copper melting. Into the furnace are placed copper cathodes, or copper in the shape of ingots, or in any form desired, and the same are reduced to the molten state. I now provide an intermediate ladle, such, for instance, as the ordinary back gear crane ladle in common use in foundries, suitably lined with fire-clay. A convenient size for the intermediate ladle will be a capacity of two or three tons. I draw into the intermediate ladle a fraction of the furnace charge, and introduce thereinto the desired quantity of zinc, quickly incorporating it into the copper. The two or three tons of brass are then promptly drawn off from the ladle and cast into ingots, or other desired shapes.

It is evident that the molten copper will be delivered to the ladle at no greater cost than to the molds in which copper ingots are cast, and that, therefore, the entire cost of making the brass will be simply the cost of materials, plus whatever zinc loss is involved, plus the ladling cost, which will be little more than that of ladling the original copper ingots. I can, of course, from one furnace charge, produce a different brass composition in each termediate ladle charge, by changing the relative proportions of the copper and zinc put into the ladle.

My invention thus eliminates entirely a large part of the present brass founding cost. The exact quantity that can be handled to advantage at a time will be largely determined by the loss of zinc that is encountered, and this quantity of copper can be regulated within quite wide limits, according to circumstances, but a suitable amount will be found to be from one to three tons. It is evident that any suitable and convenient source of heat may be used, the only condition for working rapidly and on a large scale being that said heat source shall be capable of melting large amounts of copper at one charge.

By the term "brass" as used herein is meant any alloy of copper and zinc, with or without the addition of other metals; and thus includes for example German silver, and high brasses, sometimes called bronzes."

Use of Perforated-Core Skim Gate.

Those who have never been in a foundry are quite apt to make the same statement, and no doubt nearly every foundryman has heard it made. When they see the melted metal running into the mold and a helper holding back the charcoal and dross with a skimmer, they say: "Why can't you strain the metal". In other words they cannot understand why it cannot be put through a sieve!

Now this remark, coming as it does from those who perhaps never saw metal poured before, or if they have, their experience has been extremely limited, appears somewhat humorous and many a founder has laughed when he heard it. That metal can actually be "strained" will be appreciated when the skim-gate illustrated in this article is understood. Not only can the molten metal be "strained" but the skim-gate has been shown to be of the right principle. It embodies a skim-gate with the principle of straining the metal and thus removing dross, charcoal, pieces of crucible and other foreign matter that may run in while the pouring is taking place. Many a casting has been spoiled by a piece of charcoal or scale from the crucible dropping off and running in with the melted metal. Small castings, to be sure are usually not affected in this manner as the gate is so small that such foreign matter does not enter. It is in the large or medium sized castings that the difficulty is caused. Small bench work does not require a skim gate and it is never used on them. If they are bad, they do not represent much loss, but are simply melted up and another mold is made; but it is the large castings that represent much loss when they are found imperfect after the mold has been dumped. It is upon such work that the skim gate has been found so serviceable. It has saved many a casting and it adds nothing to the cost of molding.

The skim-gate herewith illustrated has been designed by Philip Duffy, the foreman of the brass foundry of the Barrows Lock Company of Lockport, Ill., and one of the most expert molders in the United States. We are indebted to Mr. Duffy for illustrations of the skim-gate and for the information contained herein. He states that he has used this form of gate on large and medium sized work for the last five years in his foundry and with excellent resulits.

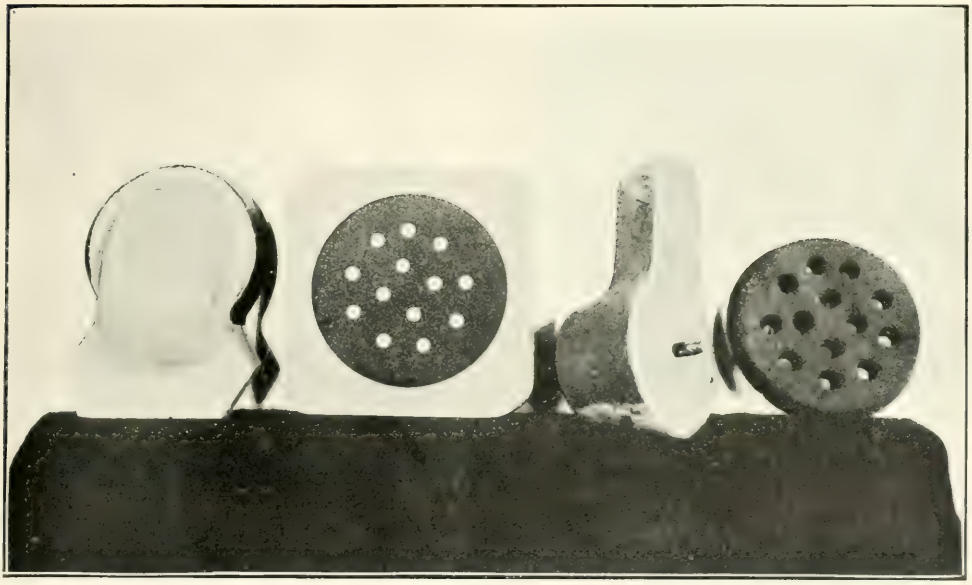


Fig. 1. Different Parts of the Skim-Gate, Showing Core-Box and Core Made from It.

In Fig. 1 is shown the various parts of the skim-gate, with the core-box and core. In Fig. 2 are shown the core-box and core made in it. The core had the holes in it as may be

seen in Fig. 1, but for some reason (probably the lighting) the holes do not show plainly. They are supposed to go clear through the core. In Fig. 3 is the completed skim-gate pattern ready for ramming-up in the mold. The core-print is painted black upon it as can be seen in the illustration.

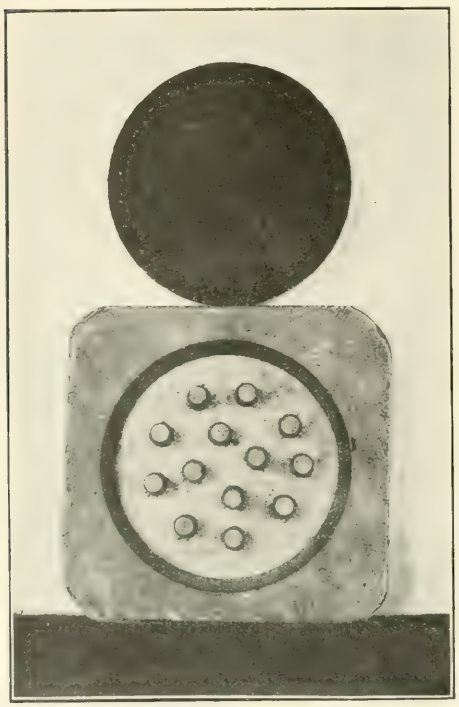


Fig. 2. The Core-Box and Core Made in It.

The skim-gate, as shown in Fig. 1 is made in two pieces only. One part is rammed up with the drag portion of the mold, and the other is rammed in the cope. The gate is made with plenty of draft so that it is easily removed. The portion rammed in the cope has a steel peg in it so as to fit the drag part. This pin, being in the center, allows the top of the skim-gate to be swung around wherever it is desired and the pouring hole in the flask may be cut on the end, side or corner of the flask. Making the skim-gate in halves so that they will swivel is very convenient and allows one kind of an adjustment in molding.

The core-box should be made of metal, in order to be durable although wood can be used if a large number of cores are not to be made, but the latter can be already used and it is preferable to make it of iron or brass. Aluminum is also good and the one shown in the illustrations was made of this metal.

The gate is rammed up with the mold and the metal is poured in the regular manner. The molten metal runs down under the core and then comes up through the holes in it,

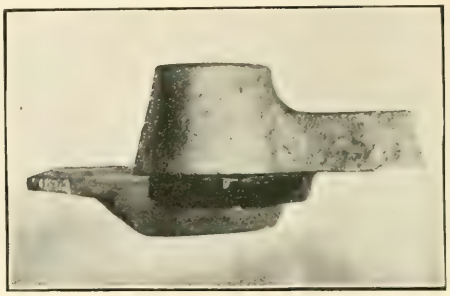


Fig. 3. The Skim-Gate Ready for Casting.

previous to entering the casting. In this manner foreign matter is effectually strained out and kept from entering the casting itself. It is possible, therefore, when used, to make better castings and the factor of uncertainty in making them is greatly reduced.

A New Strong Brass Alloy Containing Silicon.

A new alloy containing silicon, and consisting of copper and zinc with a little tin, has recently been patented* by Alfred Schmid of Zürich, Switzerland. The following proportions are given as the best and most satisfactory alloy:

Copper	58 lbs.
Zinc	40 lbs.
Tin	1 lb.
30% Silicon-Copper	1 lb.

These proportions give the following percentages:

Copper	58.70%
Zinc	40.00%
Tin	1.00%
Silicon	0.30%

It is claimed by the inventor that this bronze (or brass, which it really is) has the following physical characteristics:

Tensile Strength ..68,000 to 78,000 lbs. sq. in.
Elastic Limit .....28,000 to 42,000 lbs. sq. in.
Elongation ..... 25% to 35%

It is likewise claimed that there is no tendency to form shrink-holes in castings and the

*U. S. Patent, 1,053,027, Oct. 1, 1912.

alloy is free from segregation. The alloy is malleable when red hot and may be rolled or forged at a red heat. The inventor states that the alloy shows a high resistance to the attacks of salt-water, dilute acids and alkalies, and in spite of its high tensile strength and toughness, it may be readily filed, drilled and turned.

Obtaining Thick Nickel Deposits.

The matter of obtaining thick deposits of nickel has been made a study by A. Holland of Paris, France and in the *Bulletin Soc. d'Encouragement pour l'Ind. Nat.* for July 1912, the following information is given:

It is stated that the difficulty of obtaining heavy deposits of nickel is in the evolution of hydrogen gas at the cathode and it was the object of the experiments carried out to prevent such an evolution. This was attempted in two ways: First, to oxidize the hydrogen given off at the cathode. Second, to prevent its formation. Two solutions are recommended:

First Solution

Water	1 gallon
Sal-Ammoniac	4 oz.
Sodium persulphate	2 oz.
Nickel sulphate	1 lb.

Second Solution

Water	1 gallon
Magnesium sulphate	1 lb.
Sodium persulphate	2 oz.
Boracic Acid	2½ oz.
Nickel sulphate	1 lb.

The two solutions previously given are intended for oxidizing the hydrogen gas given off at the cathode. The following solution however, is said to evolve no gas at all and with a 0.3 ampere current on a 42 sq. cm. surface. This solution, it will be noted, contains no oxidizers:

Third Solution.

Water	1 gallon
Magnesium chloride	1 lb.
Boracic acid	2 oz.
Nickel sulphate	1 lb.

It is stated, however, that the best results in nickel plating were obtained by the use of nickel fluoborate solutions. The usual idea is that boracic acid can be dissolved by hydrofluoric acid and the nickel neutralized by nickel carbonate. The preparation of the bath is not as simple as it would seem and the following method is recommended for preparing it.

To make 2 litres of the solution, take 350 grams of sodium carbonate dissolved in 1 litre of water and pour it into a warm solution of 600 grams of nickel sulphate in 5.5 litres of water. The precipitate of nickel carbonate is washed, first by decantation and then on a filter until the wash water gives no reaction with barium chloride, showing that all the sodium sulphate has been washed out. This plastic nickel carbonate should not be allowed to dry.

Now dissolve 130 grams of boracic acid in 250 c. c. of hot water and add to it, while stirring, 285 grams of 43-46 per-cent commercial hydrofluoric acid, a little at a time. Now add the plastic nickel carbonate. When there is no further evolution of carbonic acid gas, stir until there is a slight amount of nickel carbonate left, giving a milky appearance to the solution. This operation, of course, cannot be done in glass, porcelain or other vitreous vessels and must be done in lead lined tanks, hard rubber or similar vessels. Now filter the solution and make up to two litres. It is stated that even with carefully prepared solution, electrolyzing with a cast nickel anode for several days is required in order to obtain the best results.

(The use of fluoborate solutions for nickel plating will, apparently, not come into general use on account of the difficulty of making them, even though they may have superior advantages.—*Editor.*)

New Electric Cleaner for Iron or Steel Wire.

In electrogalvanizing or electroplating iron or steel wire, strip, etc., in quantities it is necessary to employ a rapid cleaning material and for this reason an electric cleaner has always been preferable. According to a process recently patented by the Langbein-Pfannhauser Werke A. G. of Leipzig-Sellerhausen, Germany the wire may be cleaned in the following manner:

The wire or strip is passed through a nearly saturated solution of sodium chlorate at the ordinary temperature. Only a short length of wire is immersed in the solution and it is made the anode. The distance between the wire and the cathode should, it is stated, be

from 6 to 8 centimeters and the current density of from 30 to 40 amperes per sq. decimeter is employed.

It is necessary that the wire should pass quickly through the solution and it is stated that a wire of from 2.0 to 3.5 millimeters in diameter requires a speed of from 4 to 15 meters per minute. Larger wires may travel at a slower speed.

Note on the Adulteration of Core-Flour.

In a paper presented by H. W. Gillette of the Aluminum Castings Co., of Detroit, Mich. at the Buffalo meeting of the American Institute of Metals, the question of the adulteration of core-flours was taken up and it was shown that a large number of such materials sold were adulterated in order to cheapen them.

This paper brings to our mind that fact that some time ago, before the chemist began to get in his "fine work", a concern in the Middle West, whose business was entirely foreign to the foundry trades, placed a core-flour on the market and it was extensively sold in the East. Some of the largest iron foundries, whose castings, of course, consumed more than the brass foundry on account of the magnitude of their work, purchased it in car-load lots, pronounced it the best flour they had ever used and continued to use it until one day a chemist found it adulterated.

This adulteration proved to be productive of good results. It was found that the manufacturer of core flour owned a marble quarry and from which there was considerable marble dust produced. This marble dust was mixed with flour sweepings in the proportions of about 1 part of flour to 1 part of marble dust. To all outward appearances the mass looked like flour.

Core-makers used this core-flour in the same proportions as ordinary flour and this is what was claimed for it: Less could be used with the production of the same results in the core. The iron founders, and, we regret to say, brass founders as well, found that the castings were coming better as there was less gas given off by the core and it was not as hard.

Although the marble quarry proprietor had actually adulterated the core-flour, he had, at the same time, educated the foundryman that he was using too much flour. Perhaps it was costly education but it frequently, like experience, is expensive. The foundryman discovered by cutting the amount of flour he used in half that the casting came better on account of less gas being given off from the core. When it was found that the core-flour contained 50 per-cent of marble dust, the foundryman began to use 50 per-cent less flour in his cores with the accompanying reduction in costs and the production of better cores.

We doubt whether the marble quarry proprietor actually knew that the core-flour would be improved by his practice, or rather that the cores would, but at the same time, he educated the foundryman to use less flour in his cores, and received his toll for doing it. The chemist, however, has put a stop to such ingenious deception.

Use of Vanadium in Casting German-Silver.

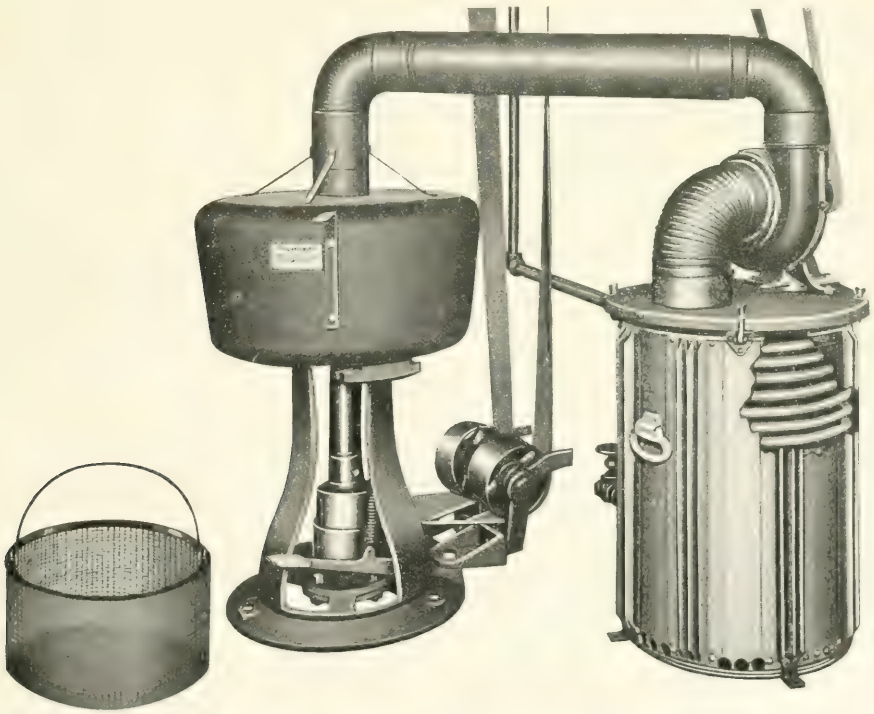
In a paper presented at the recent meeting of the *American Institute of Metals* at Buffalo, C. P. Karr of the Standard Chemical Co., of Pittsburgh, Pa., stated that the addition of vanadium to German-silver is very beneficial. He said:

"Very perfect castings have been secured by adding four ounces of cupro-nickel-vanadium to the molten bath, just about five minutes before the heat is ready to pour. The best procedure is to have the cupro-nickel-vanadium either in a granulated form or broken into small pieces, wrapped in a piece of paper so as to keep the mass together, allow the little heap to become bright cherry red, and then push it down below the surface, and hold it there, with an inverted cupped disc, the handle to which is about four feet long. The mass is held down near the bottom of the pot until it is completely absorbed by the charge. Then gently stir with a pumping motion, and allow the charge to remain quietly for about five minutes, so as to give the vanadium a proper chance to perform its scouring and purifying action. The vanadium exerts no deleterious action upon the texture of the crucible. When the metal reaches a clear, limpid state, as evidenced by its greater mobility, the heat is ready to pour. Lambent flames of zinc oxide flare up at the sides when the metal is in a perfect condition."

A New; Small "Tolhurst" Centrifugal Drying Out Machine.

The success that has followed the use of the "Tolhurst" centrifugal machine for drying out work after plating, dipping, tinning, tumbling, etc., has brought about a demand for a small machine for use in small establishments where a limited amount of work can be done and where a large machine would be too expensive to permit installation.

This company, has therefore, brought out a small machine as herewith illustrated. The machine is very light and easily handled, and at the same time is strong and durable. It has removable baskets and two sizes may be used in it, i. e. 12 inch and 16 inch. This feature will enable a manufacturer to dry-out different kinds of work, and at the same time, keep them separate.



The New "Tolhurst" Centrifugal Machine for Drying-Out Small Quantities of Metal Goods.

The machine is fitted with a hot-air drying out device and the principle of which has been patented by the Tolhurst Machine Co. This feature consists in the use of a blast of hot air forced by means of a forced blast, directly upon the work being dried out and while it is being revolved in the machine. This hot air feature serves to rapidly dry out difficult work such as shells which hold water tenaciously, and in addition, it produces a brighter surface on plated work. It has been found that this blast of air, when used on nickel plated goods after they have been plated and are being dried out in the machine, will greatly improve the surface and produce a brighter and cleaner nickel. In other words it will actually brighten the goods after plating and they will be found to have a much better finish than when dried in sawdust.

The machine can be used, if desired without the hot air feature and it is, therefore, a combination machine. There are many classes of goods which do not need it, and others cannot be successfully treated without it.

The value of a centrifugal machine lies in the fact that large quantities of work may be dried out in a rapid and thorough manner without the use of sawdust. The goods are placed in the basket and the machine started. Revolving as it does at a high speed, the moisture is actually forced off by the centrifugal motion and the work expeditiously dried. It

comes out, of course, free from stain and moisture and the necessity of using another operation to remove the sawdust is obviated.

This machine is manufactured by the Tolhurst Machine Works of Troy, N. Y. and who likewise manufacture large machines for manufacturers who have large quantities of work to treat. The small machine is intended for those who have a limited amount of work to dry.

Oxygen in Brass.*

By Prof. Thomas Turner.

It is generally recognized by practical men that brass may be spoiled under certain circumstances as a result of oxidation. For example, brass which has been poured at a lower temperature than usual is apt to be inferior, and this is attributed to the entanglement of oxide of zinc in the metal owing to its viscid or plastic character. It is believed that the inclusion of oxide of zinc in this way may be one of the causes which occasionally lead to rapid and irregular corrosion in condenser tubes. When sheet brass is annealed in a reducing atmosphere, dezincification may take place, owing to the volatilisation of zinc; but if the atmosphere is oxidising, a certain amount of oxide of zinc may also be produced in the alloy, and rottenness result. The conditions under which such results are produced do not appear to be well understood, while the manner in which oxygen acts is generally a matter of doubt.

Now the presence of oxygen has not been recorded in the gases extracted from brass when heated in a vacuum, and the author's experiments show that copper oxide cannot possibly exist dissolved in brass, as it would be immediately decomposed when the alloy was melted. The only oxide which can exist would appear to be oxide of zinc, but there is no evidence to prove that oxide of zinc can dissolve in brass any more than that it can dissolve in zinc itself; nor is there any microscopic evidence of the separation of oxide of zinc in brass either as a eutectic or in any similar form. We are driven, then, to the conclusion that any oxide of zinc that may be present is mechanically entangled, and when it has any effect upon the microsopic structure it is represented merely by minute holes in which it originally occurred, but from which it has been removed during the processes of polishing and etching.

Estimation of Oxygen

The usual method of estimating oxygen in copper is that introduced by Archbutt. This is unsatisfactory, and further attempts have shown that no accurate determination of oxygen in brass can be made by adopting the methods which are suitable for copper. A description of a simple and direct process for the accurate determination of oxygen in brass would be appreciated by many who are interested in the subject.

* A paper presented at the meeting of the Institute of Metals, held in London, England, Sept. 25th, 1912.

The New, White Silver Finish for Art Metal Goods.

A new, white silver finish is now being placed on the market by manufacturers of art metal goods and at present is confined almost entirely to those who make their wares of antimonial-lead or spelter. While it can, of course, be applied to all kinds of metal goods, at present it seems to be confined to soft metal wares.

This finish has been placed on the market as a pleasing diversion from the now time-worn finish for soft metal goods, and it may be said that it is practically the same thing in silver that the ormolu finish is in gold, except, perhaps, with slight modifications in the way of tinting. Otherwise it is done in the same manner.

The finish is known by a number of names and may easily be recognized when seen. The high-lights on the article are burnished or buffed to a high color, and the background is either left with the dead, white silver deposit or tinted by means of a colored, tinted, or pigment lacquer. The effect is quite pleasing.

The method of producing this finish is practically the same as that of the well known ormolu-gold finish. The soft metal article is first cleaned and then "struck" in a hot (i. e. from 120 to 150 degrees F.) cyanide copper solution rather weak so as to avoid blistering. It is then given a copper deposit in an acid copper solution. This deposit takes from one to one and a half hours and when finished, has a matt surface of uniform quality all over. This is the base of the silver deposit and if well done, will have a velvety appearance. However, as it is necessary to do the work in

quantities and this acid copper deposit is very easily stained, it is customary to run the article, after it has been copper plated in the acid copper solution and previous to silver plating, through a bright acid dip to take the stain off and give a uniform surface. It is then ready for the silver plating.

The silver plating solution used should contain a liberal quantity of silver so that it will deposit dead and white, and not contain too much free cyanide. If there is an excessive amount of free cyanide, then the silver is apt to deposit more or less bright and this is not what is wanted. The following solution is suitable for this purpose:

Water	1 gallon
Silver	3 oz.
Free Cyanide	3 oz.

Use about 1 volt in the deposition of the silver. After the required amount has been put on, then the high lights are burnished and the whole lacquered with a suitable silver lacquer. If, however, the background is to be tinted, this is done after burnishing the high lights by means of a spray.

A New Compound for Use in Machining Aluminum.

The machining of aluminum, particularly the pure metal or a soft alloy, is not a satisfactory operation as it is so soft and tough that the tool drags and tears. In tapping, for example, the chips stick between the threads and the tap and the result is not only the formation of an imperfect thread, but often causes the breakage of the tap.

Hayden A. Kern of Dayton, Ohio, has patented a compound for use in machining aluminum of all kinds and which is made in the following manner:

Beeswax	1 lb.
Gasolene	5 lbs.
Turpentine	1 lb.

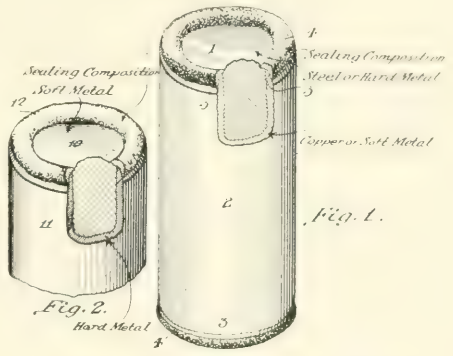
The beeswax is melted and all fire or flame removed from it. The turpentine is then added and the whole stirred. When cool, or still liquid, the gasolene is added.

The mass, which will be more or less pasty so that it can readily be applied, is used in the same manner that oil would be employed in tapping or drilling. It is claimed that excellent results can be obtained in tapping aluminum when it is used and with the formation of clean, accurate threads.

Making A Compound Copper and Steel Billet.

The manufacture of compound metals, such as a composite wire of copper with a steel core, is now receiving much attention. The object is to obtain a cheap material with the non-corrosive properties of the coating metal, and at the same time obtain the strength of the steel.

A patent recently issued to John A. Auth of Colonial, Pa., relates to a method of producing such compound material. While suited for making steel coated material with various kinds of coating metal, copper is the metal generally employed for the reason that it supplies a demand for electrical work.



Method of Making the Compound Billet.

The following is the method used. A steel core and a copper tube for the shell are used:

The hard bar is cleaned in any suitable manner, preferably by sand blast or pickling in a bath of sulphuric acid. After the bar is cleaned by pickling in the usual manner, it is washed with fresh water, after which it is submerged in a bath of hot water for heating it. The heated bar is removed from the hot water bath and placed on a rack to dry, the heat of the bar rapidly drying the moisture upon the periphery thereof. When the bar is cleaned by a sand blast, it is not submerged in the fresh water or the hot water bath. The bar, after being cleaned in the foregoing manner, is then placed under a drop hammer and a soft metal tube, of the same length as the bar, placed over one end of the bar.

The soft metal tube is then driven over the bar. The diameter of the tube is full, while the diameter of the bar is scant, that is to say, it will be assumed that the inner diameter

of the tube is three and one-quarter inches, this diameter is full, while the diameter of the bar is three and one-quarter inches, yet this diameter is scant. Such arrangement makes an unusually snug fit between the tube and bar when the tube is driven over the bar. The soft metal tube may be of any desired thickness. The driving of the tube over the bar forms what is termed an ingot, or in other words, a composite bar having a hard metal core and a soft metal sheath.

The composite bar is then stood on end and a conical shaped cap mounted upon said end, the cap is struck with a hammer whereby the end of the bar is closed, the end of the tube being contracted, due to the fact that the cap is conical in contour. The bending in of the tube is clearly shown in Fig. 1. The other end of the composite bar is subjected to a like operation. After the ends of the bar have been turned in or contracted, the bar is laid on a rack and each end coated with a liquid composition which readily hardens to prevent entrance of air between the sheath and the core so as to overcome any possibility of oxidation of the hard metal core. Preferably the liquid composition employed consists of water, silicate of sodium and pulverized asbestos, the latter and soda being in equal proportions. After the composition has set, the bar is heated and then while hot rolled to the desired diameter and the pressure of the rolls completes the weld. The composition is such that when the bar is heated, it will expand with the soft metal whereby the seal at each end of the bar will not be broken.

The "Royal" Prepared Nickel Plating Salts.

The increasing attention that is now being paid to nickel plating has led R. F. Lang, 31 Broadway, New York City, the well known importer, to introduce the "Royal" prepared nickel salts and he is now importing them for the trade. They have made their first appearance upon the American market through his efforts.

The salts are ready for plating and are simply dissolved in water in the proportions given when the nickel plating solution will be ready for use. The properties of the salts and the nickel deposit produced are enumerated in the following statements given out by Mr. Lang:

"The solution can be worked at a high density giving the bath the ever sought for conductivity. High density and high con ductivity insure quick action and a bright nickel deposit."

"The salts will deposit three times as much nickel in a given time as any other nickel solution."

"Highly buffed surfaces of brass, copper britannia, steel, iron, etc., if plated with the salts, will need no buffing."

"On a buffed surface, the deposit is brilliant and a non-buffed surface is silvery white."

"The baths need little replenishing inasmuch as they feed considerably from the anodes, and a small addition of salts from time to time will keep the baths in working order."

"The salts are absolutely free from impurities and the baths will remain pure and free from iron."

"A thorough, dense, tough, homogeneous and non-porous deposit is produced of any desired thickness, precluding corrosive action of the atmosphere, water and chemicals."

The salts are made in eight different varieties for the large variety of work that is encountered in commercial work. This gives a solution for every kind of work, from that required for producing a heavy nickel electrotype to the thinnest coating on cheap articles.

Use of Aluminum in Place of Tin-Foil.

The high price of tin, while not appreciably checking consumption so far, must nevertheless tell sooner or later upon a number of the minor uses of the metal for which the employment of substitutes is possible. One of these, it seems, is aluminum foil for the wrapping of such articles as cheese, chocolate, tobacco, and fruit. It required long experiments before it was found possible to roll the metal sufficiently thin, but it is being successfully done now at the La Praz Works in France. The rolling is done in six stages, the last of which yields a leaf only 0.0.00016 in. in thickness. A still thinner foil can be obtained by laying several sheets together and rolling them down as a whole or beating them as is done in the case of gold leaf.—*The Ironmonger.*

Practically all cadmium produced is obtained as a by-product in zinc smelting as it is found associated with zinc ores.

Brass and Bronze Plating Solutions and How to Make Them.

Tenth Paper.

Spotting-Out.

As brass deposits are now extensively used for plating malleable and gray iron castings, the spotting-out difficulty is one of the obstacles encountered in brass plating.

Spotting-out is caused by the plating solution entering pores or imperfections in the metal during the plating (and in this connection it may be said that liquid seems to penetrate more deeply during the plating than if allowed to lie in the same solution for the same length of time. The electric current, apparently causes it by some unexplained action). When the castings are finished, this solution begins to ooze out and spreads over the surface in the region of the cavity from which it exudes, staining and attacking the surface.

Early in the days when the cause of spotting-out began to be well understood, attempts were made to obtain castings that would not spot out. This was found impossible and it then became the duty of the plater, as it is now, "to make the best of a bad job" and use the castings as he obtains them. He must cure the evils to which the castings are subject.

Many cases of spotting-out can easily be cured by a good rinsing and this, it is believed, is not well understood. If the cavity in the casting is filled with plating solution, it will gradually work out and cause spotting. If, however, it is removed in rinsing and pure water takes its place, then this substance will not cause spotting.

Platers acquire the habit of "swishing" work, after plating, through the rinse waters. This will do for sheet metal or plain work made of wire or sheet metal that is not porous, but with castings it will not do and there is sure to be spotting-out. There is only one thing to do and that is to soak out the plating solution in the cavities with hot water. Hot water should always be used as it acts far more rapidly and energetically than cold water. Use clean, hot water and place the castings in it. The hotter the better and if actually boiling the operation will be more rapid. Change the water if necessary so as to insure that it is clean and allow the soaking to take place from half an hour or an hour, or even longer. Then remove, rinse in the usual manner and dry. It will be found that the solution has been removed from the pores or cavities in the casting. It is believed that this treatment will cure nearly all the cases of spotting-out if thoroughly and carefully done.

Another method in use, which takes longer than the previous treatment and is not as good, is to allow the castings to remain until the spotting-out is over. This may take several weeks. Then the castings are finished. It is assumed that the solution, coming out of the pores, has done all the damage it can, and that the casting may safely be finished, by buffing or dipping. If allowed to lie sufficiently long, this may be the case, but if too short a time is taken, then it will not answer. Placing in a warm location assists the operation and the solution then exudes from the cavities better than if cold. This process may answer for a heavy brass deposit, but if light, the solution, when it attacks the deposit and produces the spotting, removes all of the brass plate.

If sodium cyanide is used in making up the plating solution for carrying on the brass plating, then the spotting out is either reduced to a minimum or overcome altogether. There should be no potassium salts at all in the solution. Sodium salts of this kind are not deliquescent and dry up when they exude from the cavities of the casting after plating. They do not, therefore, have the tendency to spot. The treatment previously mentioned in regard to hot water should not be omitted, however, as the solution oozing from the pores, even though it does dry, will cause difficulties, although far less and of a different kind than when potassium cyanide or potash salts are used in the plating bath.

Dip silvering may readily be carried out on brass goods without the use of the current. The solution is made by dissolving ¼ oz. of nitrate of silver in 2 gallons of water and then adding 1 lb. of potassium cyanide. A clear solution is obtained. The brass work is dipped into the solution heated to about 150 degrees F.

An Improved Dip-Silvering Bath.

Dip silvering may be employed for a large variety of work with excellent results and is not expensive as the amount of silver deposited on the articles is minute and is always the same. As no electric current is necessary the process is simple and easily accomplished. For whitening such small articles as hooks and eyes, pins, eyelets, and similar goods that must be done in quantities it has no equal and the color of the silver is very satisfactory.

In dip silvering, the solution used is of the utmost importance and unless properly made the operation is not successful. While a silver deposit can be obtained from an ordinary silver plating solution when brass or copper goods are immersed in it, the silver is not white and does not adhere well. In the first place, it contains free cyanide, which must *not* be present in a dip silvering bath, and in the second place there is too much silver in it. A good dip silvering solution should contain very little silver and no free cyanide at all.

The ordinary dip silvering solution used at the present time is made from nitrate of silver and potassium cyanide or sodium cyanide. It is an heirloom of Roseleur and to him apparently belongs to the credit of concocting it. The solution is excellent, however, and was fully described in THE BRASS WORLD, March 1910, page 99. It is easily made up and for ordinary purposes is, perhaps, the most suitable on account of the fact that nitrate of silver can always be obtained and it is simply dissolved in the necessary quantity of potassium or sodium cyanides. Those who desire the simplest and most easily made dip-silvering solution should use it.

It has been found, however, that if silver cyanide is used instead of silver nitrate that the bath gives better results. The silver deposit is white and cleaner. Such a bath is made as follows:

To make 2 Gallons

Take ¼ oz. of fine silver and dissolve in nitric acid. Then evaporate off the acid in a porcelain dish and fuse the nitrate of silver so that it liquefies. This removes the free acid. If desired, instead of ¼ oz. of pure silver, 3/8 oz. of fused nitrate of silver may be used, (this contains ¼ oz. of silver) and the making is shunned. The nitrate may be purchased.

Take the nitrate of silver thus produced and dissolve in 1 quart of water. Then add a solution of potassium cyanide to it with stirring until the precipitate no longer forms. Add no more or the silver cyanide thus produced will redissolve. Now filter out the silver cyanide and wash well with water (preferably hot). The object is to wash out all of the potassium nitrate formed by the reaction.

When washed do not allow to dry. Rinse from the filter into 1 gallon of water and stir up so as to make an emulsion. This is called "Solution A".

For "Solution B" dissolve 1 lb. of potassium cyanide in 1 gallon of water.

Now warm the "Solution A" or that containing the silver cyanide in suspension (it does not dissolve in the water, of course) so that it is at about 120 degrees. When in this condition, add "Solution B." or the potassium cyanide soltuion to it. Do not add all at once as there is a critical point at which the addition of the cyanide must be stopped. This point is reached in the following manner:

Add the cyanide a little at a time, until the point is reached when all of the silver cyanide is just dissolved and then add no more. The object is to use exactly enough cyanide to dissolve the silver cyanide but no more. There should be no free cyanide at all in the solution. The exact amount of cyanide necessary cannot be given as it is of varying strength, so that it must be used in the manner indicated.

When finished, there is obtained a solution of silver cyanide in potassium cyanide and about 2 gallons in bulk.

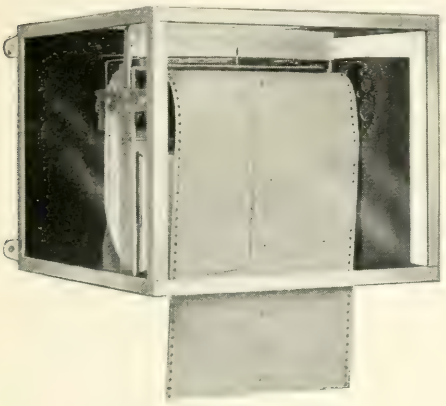
The solution is used hot and only brass or copper or brass or copper plated articles can be used. The temperature of the solution need not be actually at boiling, and better results are obtained if less. About 150° F. is a good temperature. The articles, previously cleaned and bright, are immersed in the solution. The silvering takes place immediately. Then remove, rinse well and in clean water as the final rinse as silver is easily stained. The goods should then be lacquered, if possible to preserve the silver against tarnishing.

Although this solution is more troublesome to make up than when silver nitrate is used, the results obtained are considered by some platers to be enough better to warrant its use.

Hard platinum is a term applied to platinum hardened with iridium. Pure platinum is as soft as the softest iron.

New Continuous Chart Recording Pyrometer.

The Brown Instrument Co., of Philadelphia, and its associate Company, the Keystone Electrical Instrument Co. have brought out a new continuous chart recording instrument, particularly designed for use as a pyrometer, but which can also be used for indicating volts, amperes, revolutions per minute, mechanical operations, etc., where a small current of electricity is required to operate a recording instrument.



The Chart Recording Pyrometer.

This new instrument is of the frictionless type, the pen making a single dot of ink momentarily on the paper at short intervals, every ten seconds, or every minute as desired, and these dots practically form a continuous line. The instrument carries a six months roll of recording paper, traveling a little over an inch an hour which does away with the necessity of changing the charts daily, and for many operations the continuous chart is preferable. The record can either be torn off as desired every day or once a week, or it can be allowed to roll up continuously.

This new instrument is very handsome in appearance, having a plate glass case as shown in the illustration and in designing the instrument it has been kept in mind that a recording instrument must be as simple and practical as possible.

Further information regarding this new type of instrument which has just been placed on the market will be gladly given by the above companies.

Notes on the Waste Occuring in the Manufacture of Brass and in Other Metallurgical Operations.

The *Bureau of Mines* has recently issued a particularly interesting pamphlet entitled, "Notes on Mineral Wastes" and of which Charles L. Parsons is the author. This pamphlet is not only of interest but the data given will prove of the utmost value in indicating the wastes that are constantly occurring in the manufacture of the non-ferrous metals. Mr. Parsons has made so many interesting discoveries and has compiled so much valuable data, that extracts from the pamphlet are herewith re-printed. It is believed that they will prove of much interest to users of non-ferrous metals:

RECOVERY OF COPPER FROM SCRAP.

Here, the junk dealer is performing an especially important service, for all scrap containing copper is eagerly sought, and the copper removed. Copper-wire scrap by the thousands of tons is annually gathered, the insulation, if present, burned off, and the whole simply remelted, poled, and cast again into wire, or into bars or ingots for redrawing. Brass, bronze, coppered tin, etc., of unknown composition, when gathered together in endless variety of kind, such as bases of electric lamps, brass and copper turnings and shavings, cartridge shells, broken and battered household goods, old pipe, brass tinsel, molding sand from brass foundries, concentrates of ashes from brass furnaces, copper paint sludge, and flue dust, much of the miscellaneous collection being briquetted, are treated direct in a copper blast furnace. From this furnace is produced an impure alloy containing about 86 per cent copper which goes to the blister furnace to be cast direct into anodes or is sent to a refining furnace to make casting copper. In the smelting the zinc, iron, nickel, tin, antimony, and lead present are entirely lost, either in the fume or in the slag. Practically all copper-bearing junk is treated in this manner, except for what medium-grade material is added directly to the reverberatories. When trimmings or turnings of some special alloy of known composition are obtained in sufficient quantity, they are usually remelted direct with more fresh material of the same composition, generally for reuse in the same works, or the same class of works, from

which they were derived, although this kind of material, in a sense, does not deserve to be classed as junk at all. However, a single smelter near New York recovers as much as 10,000,000 pounds of copper a year from true junk, and many other works throughout the country are resmelting such material.

PRODUCTION OF NICKEL AND COBALT.

Nearly all of the nickel used in the United States is imported from Canada. Large quantities of this metal are, however, known to exist in Idaho, and an immense deposit of a low-grade, hydrous nickel-magnesium silicate occurs at Webster, N. C. The latter deposit contains millions of tons, but owing to its low-grade character no method of economically working the material has yet been found. Of course, the same statement was true of similar ores of copper ten years ago, but this nickel ore has the disadvantage that it is not amenable to ordinary methods of gravity concentration. A few tons of nickel are made from the nickel that accumulates in the electrolyte of copper refineries and one smelter in the Northwest is producing some metal. The larger part of the output is understood to be now used in the form of monel metal, an alloy obtained direct from the ore and in which the expense of first separating pure nickel has consequently been avoided. The use of nickel as a catalytic agent to bring about the absorption of hydrogen by certain oils and fats has recently become important, as valuable commercial products are obtained.

The production of cobalt in the United States is a problem connected almost solely with imported Canadian silver ores from the famous Cobalt, Ontario, district. Cobalt oxide has recently much decreased in price owing to the greatly increased supply, so that the old well-known uses of coloring glass and pottery blue, or of neutralizing the straw yellows of titanium in porcelain and china no longer absorb the output. A new alloy with chromium has been proposed for making cutlery. The cutlery made of the alloy holds a good edge and withstands corrosion and this use may increase the demand. The alloy could be substituted for nickel in most uses of that metal but its higher price prevents.

RECOVERY OF ZINC FROM SCRAP.

Owing to the comparatively low price of zinc there has not been the same interest in its recovery as in that of some of the other metals. About two-thirds of the zinc produced goes into the form of galvanized iron and a considerable proportion of the remainder into brass and other alloys. The zinc dross from the galvanizing of iron is returned to the zinc smelters and redistilled. The metal used to galvanize iron, although it greatly preserves the iron itself, is finally almost a total loss. Galvanized scrap, to be available for iron making, must first have its zinc removed, which can be done in a reverberatory furnace with oxidizing flame, the zinc passing up the stack. The zinc oxide is seldom recovered but can easily be saved when heat from oil or gas burners is used, and one plant in western Pennsylvania is recovering from clean galvanized scrap about 50 per cent of the zinc in the form of zinc oxide, which can be sold directly for paint. Almost no galvanized iron, except the clean scrap cut from the first sheets, is retreated. The quantities of this scrap have been as high as 300 tons per day, but are diminishing as the result of shaping the articles to be galvanized before the zinc coating is applied.

In order to have the iron from either tin or zinc scrap available for open-hearth steel work, the tin must be reduced to about two-tenths of 1 per cent and zinc to about three-tenths. Accordingly, from galvanized scrap some 10 to 12 per cent of zinc goes to waste. Much old scrap is smelted for sash weights, being useless for most other purposes.

A newly invented process for using some of the zinc drosses from galvanizing by treating them with still more iron and then coating small iron articles and wire with this iron-zinc alloy has a promising field of usefulness.

Some 40,000,000 pounds of zinc oxide are used annually for a filling in automobile tires, and the remainder of the 60,000 tons now produced annually in the United States is used chiefly in paint. In neither instance is the zinc ever recovered.

WASTES IN BRASS MANUFACTURE.

W. H. Bassett has brought out very clearly the great losses of zinc in modern methods of brass manufacture and states that there is 6 per cent of the zinc present lost in making brass castings and probably 10 per cent loss in making wrought brass. Brass furnaces are capable of great improvement, and it is certain that special forms of furnaces using an open blast cause even greater losses than those above mentioned. A careful study of the fur-

naces melting brass would almost certainly produce beneficial results. The problem is one of the greatest importance in the conservation of waste in alloy manufacture.

At atmospheric pressure pure zinc boils at about 930° F. When zinc is diluted with copper the boiling temperature of the mixture is, however, much higher. In present practice these zinc alloys are melted, either in crucibles with a simple charcoal cover or in open gas-fired furnaces. In the practically open containers of this kind it is not at all surprising that zinc sublimes from brass or other alloys at temperatures even below its melting point, for the vapor pressure of the zinc has no chance of ever reaching atmospheric pressure, since the vapor is continually carried away by the air currents.

The solution of the problem of eliminating this loss is undoubtedly the use of a closed furnace of some kind; an electric furnace properly constructed to overcome other difficulties, of which there are many, would be ideal. The cost of current might be high, but other advantages, such as large units, easy stirring, low labor cost, nonintermittent firing, and saving of zinc, would probably more than compensate. Every theoretical consideration indicates that there should be a great field for the electric furnace in connection with zinc alloys, and that with its use the present great losses of zinc in alloys would be largely overcome. Catching the zinc oxide from the present form of furnace is easy with modern methods of dust catching; but if coal or coke be used the oxide caught is so mixed with foreign material as to be worthless, except possibly for making zinc chloride for impregnating timber. By substituting petroleum or producer gas in firing, the recovery of the zinc oxide would probably even now pay commercially, but the problem of preventing its formation would seem to be even simpler.

In brass manufacture large quantities of clean scrap of known composition are directly remelted, with the addition of spelter to make up for that which is carried off in the flues. It is estimated that 7,500 pounds of zinc are passing into the atmosphere daily in the form of zinc oxide from the stacks of the brass-casting shops in Waterbury, Conn., alone. Dirty scrap, as well as the concentrates from the ashes of crucible furnaces and from molders' sand, are generally worked up as previously described in the recovery of copper, the zinc contained, roughly estimated as over 2,000,000 pounds per year, being a total loss.

As already indicated, there is no broader field for research or one that offers more to the cause of conservation than zinc losses and their prevention.

CONSERVATION OF GOLD AND SILVER.

The high value of gold and silver has not only been a natural incentive for the conservation of those metals, but has made profitable the recovery of all waste in their production. The cyanide process for dissolving gold gives a very high recovery and has largely superseded chlorination. Wherever lead or copper smelters are available the ores, unless of unusual richness, are simply smelted with the lead or copper ores. The silver and the gold are recovered from the lead by the Parkes process and from the copper through the residues from the electrolytic refining. The doré obtained is almost always refined electrolytically with some recovery of platinum and palladium from the electrolyte.

Gold and silver are being gradually accumulated in the world's stock. Scrap metal is gathered from the large manufacturing firms, and even the sweepings from small jewelers' shops are saved. Sweepings are also collected from dental houses. These so-called sweepings are generally hand sorted, platinum- residues going to platinum refiners. The more valuable portion of the silver and gold scrap is melted with copper into bars and sold to the refiners on an assay basis. The bars are then cast into small anodes and the copper is separated analytically, the gold and silver going into the sludge to be treated in the regular manner. The copper anodes produced are always remelted and passed to the regular copper refinery, this double refining being commercially profitable on account of the quick recovery of the major part of the gold and silver, and the consequent lessening of interest charges. The poorer quality of scrap is broken up in ball mills to a fine powder so as to be readily sampled, and this class of "sweeps" is briquetted with a lime binder and is used as a part of the charge of a lead or a copper blast or shaft furnace.

NEED OF PLATINUM AND PALLADIUM.

Every effort should be made to search systematically for platinum in the placer and ore deposits of the western States, for the demand has greatly increased. Owing to the popular craze for platinum in jewelry and owing to its use in dentistry the price of this

metal, which is now absolutely essential to scientific research, has trebled in recent years. One producing company is now obtaining each month about 150 ounces of mixed platinum palladium, which contains about 120 ounces of palladium. The metal is being saved in the refining plants, although as a rule smelters do not as yet allow anything for it in ores.

Platinum is being sought more and more in the West. The Rambler mine, which was supposed to be worked out, has seemingly struck ore again. This ore formerly carried about $14 worth of platinum per ton.

Palladium is used in jewerly and also in making the dividing scales of delicate astronomical instruments. Its price per ounce is about the same as that of platinum, but palladium has the advantage of lower specific gravity.

Platinum is being conserved by the substitution of a wire of nickel-chromium alloy covered with platinum for the entrance wire of electric-lamp bulbs. This alloy is also being used for other purposes for which pure platinum was formerly used. Also it is probable that the alloy developed by S. W. Parr, which is extremely resistant both to heat and acids, will find application in calorimeter bombs and for other purposes for which platinum is now required.

Use of Nickel in Increasing the Tensile Strength of Gun-Metal Castings.

In his paper on "Foundry Tests and Foundry Practice" read by W. R. Dean of the Hyde Windlass Co., Bath, Maine before the Buffalo Meeting of the American Institute of Metals, it was stated that the addition of from 0.25 to 0.50 per cent of nickel to a gun-metal mixture (consisting of the following: 88% copper, 10% tin and 2% zinc,) greatly increases the tensile strength.

He said that castings without the addition of nickel would show only from 28,000 to 33,000 lbs. per sq. in. tensile strength, while with the amount of nickel previously mentioned, from 38,000 to 42,000 lbs. can be obtained.

Streaks on black nickel deposits are caused by the use of either too strong a current or the solution having become acid.

New Process for Depositing Metals on China, Porcelain, Glass and Other Viterous Materials.

Pascal Marino of London, England has patented the following process for metallizing non-metallic substances such as china, glass porcelain and other vitreous materials. He describes his process in the following manner:

"The invention relates to a process whereby articles made of china, glass, crystal, porcelain or other silicious material may be superfically coated with metal with the view more particularly of enabling them to receive an electrolytic deposit of silver, gold, platinum, nickel, copper, tin, zinc or other metal, or of a metallic alloy such as brass, bronze, etc.

Inasmuch as an article made of the material is not a conductor of electricity, a metal or metallic alloy cannot, unless special provision is made to do so, be electrolytically deposited upon its surface, and hence it is absolutely necessary that the surface of the article should be coated with a conductive covering to act as the negative electrode in an electrolytic bath containing the metal or metallic alloy with which the article is to be coated.

The process of my invention is characterized by the fact that the article is submitted to a first operation which consists in coating it with silver fluoride and then exposing it to the action of a stream of illuminating coal gas, and subsequently submitted to a second operation which consists in heating the article to about 50° C. and exposing it to a stream of carbon bisulphide vapor, these operations being carried out for the purpose of bringing about chemical reactions whereby the surface of a porcelain, glass or earthenware article becomes metallized and thus rendered capable of conducting an electric current.

It is necessary that the surface of the article to be treated should be rugous and absorbent and free from enamel, varnish or gloss which would prevent the surface from absorbing the silver fluoride solution, the application of which to the article to be treated constitutes the first step of the process.

The first operation results in the formation of a thin firmly adherent and continuous coating or pellicle containing minute particles of silver, upon the article being treated, the molecules of silver penetrating into the article,

wholly covering the portion treated and firmly adhering to the surface thereof.

The second operation transforms the silver with which the article has become coated into silver sulphide which forms a strongly adherent deposit on the surface of the article.

In order to increase the adherence of the deposit the metallized surface of the article should be submitted to the action of a rapidly rotating wire brush of brass, zinc, copper or the like, the friction produced increasing the adherence of the layer of silver to such an extent that the article may be washed in water without detriment to the deposit.

By means of this treatment an article which is to be coated by electrolysis (and which forms the cathode in the bath) is in such a condition that the electrolytically deposited layer of metal or metallic alloy is strongly adherent and capable of resisting the action of high temperatures. The composition of the electrolyte would of course depend upon the particular metal or metallic alloy to be deposited.

As will be seen, my invention not only permits of glass, porcelain and other silicious articles being easily coated with an electrolytic deposit of metal, but furthermore enables articles so coated to be soldered or joined to one another or to any metallic article. A metal foot, handle, or ring may be soldered to a cup, saucer, plate, vase or any other utensil which has been coated with an electrolytic metallic deposit."

Recovery of Zinc From Galvanized Iron Scrap.

A method of recovering zinc from galvanized iron scrap has been patented by Eduard Broemme of St. Petersburgh, Russia and Rudolf Steinau of Nuremberg, Germany. The process is as follows:

The scrap is boiled in a solution of sodium bisulphate and common salt (equal parts of each are used) until the zinc has gone into solution. It is stated that a very pure solution of chloride of zinc is obtained that contains sodium sulphate, sodium chloride and only traces of iron and manganese.

This solution it is stated in the patent, can be used for the manufacture of lithophone, a material used in the making of rubber goods, and which is a compound barium and zinc sulphide.

An Improved Electrogalvanizing Solution.

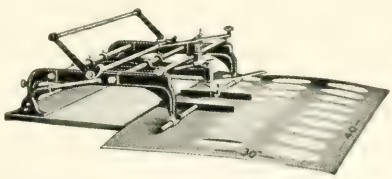
According to an English patent recently issued to U. C. Tainton and J. N. Pring, the following solution can be used for electrogalvanizing with good results:

Water	1 gallon
Sulphate of Zinc	2 lbs.
Sulphuric Acid	10 oz.
Gum Tragacanth	1 oz.

The current density used may be high, the patentees say, and up to 500 amperes per sq. ft. of cathode surface may be employed. It is stated that the zinc deposits smooth and with a lustrous surface. While intended for electrogalvanizing, the inventors state that the solution may be used for the refining of zinc electrolytically.

A Machine for Cutting Ovals and Circles.

Manufacturers of metal novelties, silversmiths and other makers of art metal goods frequently have occasion to cut paper, celluloid, glass, hard rubber or other materials in oval or circular form and ordinarily it is a difficult job.



The Machine for Cutting Ovals and Circles.

The Shawver Company of Springfield, Ohio have put on the market a machine for cutting ovals from the above materials and which is herewith illustrated. The machine is adjustable and is made in three sizes. The small size will cut circles or ovals up to 15 inches in diameter or across the short dimension of the oval. The large size will cut circles up to 22 inches in diamter and an oval up to 22 x 24 inches.

Palm oil and nuts rank third among the native products of the Belgian Kongo, being exceeded by rubber and ivory. Palm oil is used in the manufacture of soap and as a flux in tinning in the manufacture of tin plate.

Why Sodium Cyanide is Economical in Electroplating.

In electroplating, there has never been any substitute found for the cyanides. Until sodium cyanide became a commercial article, potassium cyanide was always used. Then came the double cyanide of potassium and sodium, and finally sodium cyanide made its appearance. Sodium cyanide is now extensively used in electroplating, and there has never been any indication so far that it will not answer equally as well as potassium cyanide.

There is one thing, however, that is always confusing to platers and this is the method of designating sodium cyanide. It is given the designation of its strength in "Potassium Cyanide Equivalent" and this is perplexing to those who have not a good knowledge of chemistry. It is a trade term, although chemically correct, but had it not grown up with the industry, it is probable that a less confusing designation could have been employed. The matter may be explained in the following manner:

What is needed in plating is cyanogen and not alkali. Therefore, the material containing the most cyanogen is the most economical at the same price. Sodium cyanide contains more cyanogen (on account of the lower atomic weight of sodium) than potassium cyanide and it is indicated in the following tables:

100 lbs. Sodium Cyanide, ... 129% = 129 lbs. 100% Potassium Cyanide.
100 lbs. Double Cyanide, ... = 99 lbs. " " "
100 lbs. Potassium Cyanide .....95/96% = 96 lbs. " " "

100 lbs. Sodium Cyanide ..... 129% contains 52 lbs. Cyanogen.
100 lbs. Double Cyanide ..... contains 39½ lbs. Cyanogen.
100 lbs. Potassium Cyanide .....95/96% contains 38.4 lbs. Cyanogen.

The same results are obtained with 77.5 lbs. of sodium cyanide as with 101.5 lbs. of the double potassium and sodium cyanides or with 104.1 lbs. of potassium cyanide. The advantage of sodium cyanide, therefore, is readily apparent.

One of the great advantages of sodium cyanide, however, is in the fact that it will not cause spotting-out like potassium cyanide When the plating solution containing it, oozes out of the pores of a casting that is being plated, the solution and salts left dry out to a powder and may be brushed off, instead of liquefying and spreading on the surface.

The Annealing of Coinage Alloys.*

By T. Kirke Rose, D. Sc.

In this paper the author remarks that the methods used in coinage are well known. The cast bars are gradually reduced in thickness by cold rolling, becoming harder with each passage through the rolls. Little has been published as to the temperature and time required for annealing in mints, and the present paper describes in detail the experiments made to determine them.

The author's researches have furnished the following general conclusions:

1. Metals and alloys when hardened by rolling are in an unstable condition at ordinary temperatures, and undergo a gradual change to the soft state. As the temperature rises this change is hastened, until at temperatures considerably below their melting points, metals and alloys revert from the hard to the soft state almost instantaneously.

2. The annealing action at any given temperature is most rapid at first and gradually dies away, so that a state of equilibrium is not attained in any short space of time, except perhaps at high temperatures. For example, equilibrium was apparently not attained in the gold-copper, silver-copper, or nickel-copper alloys, or in pure nickel in sixteen days at 300°. At high temperatures almost the whole result is obtained instantaneously, though a little extra softness is got by prolonging the time. A few minutes at such a temperature cannot be replaced, for practical purposes, even by hours of annealing at much lower temperatures. No critical points, however, were observed.

3. When the change from the hard to the soft state takes place, recrystallisation occurs almost if not quite simultaneously. The re-

*A paper presented at the Meeting of the Institute of Metals, held in London, England, Sept. 25th. 1912.

crystallisation which is visible under low magnifying powers lags behind the softening to some extent.

4. Visible recrystallisation and softening occur so rapidly at low temperatures, *e. g.* 200° in pure gold, as to preclude the possibility that they are dependent on diffusion. At higher temperatures crystals bounded by straight lines are produced under conditions favorable to the action of diffusion.

5. In some cases (*e. g.* gold-copper alloys) alloys do not begin to soften rapidly until temperatures above that at which the predominant metal can be annealed, and the annealing extends over a greater range of temperature than that required for the pure metal. In other cases (*e. g.* nickel-copper alloys) there is no great difference in these respects between the alloys and the predominant metals.

6. The expansion taking place on softening is far greater in alloys than in pure metals. The first softening and the breaking up of the distorted primary crystals into smaller ones with ragged edges is accompanied by a partial expansion. The remainder of the expansion accompanies a further slight softening and the formation of crystals bounded by straight lines.

National ElectroPlaters' Association.

The monthly meeting of the National Electroplaters' Association was held in New York City on Friday evening, October 25th. Several new members were elected. S. Shoeld, electrochemist addressed the meeting and explained the use of barium cyanide for regenerating silver plating solutions. This substance removes the potassium and sodium carbonates in the solution.

Samples of bright platinum plating were exhibited by Mr. Smith, together with some silver anodes which had a bright and clean reduction in the bath. These anodes originally weighed 100 ozs. and wore to practically 5 oz.

Arrangements are to be made for a banquet to be held in the Spring of 1913. A convention has also been proposed.

A rough and warty silver deposit is frequently caused by the use of too old a silver solution. It has become filled with inert salts and these produce the rough deposit.

The British Standard of Silver-Plate.

The reference to the Britannia standard of silver-plate by "Bypasser" in *The Ironmonger* of September 14 (p. 48) recalls a period in the reign of William III. when the country was suffering from a shortage of silver coinage, and the quaint methods adopted by the Legislature of the day to remedy the evil. At that time the legal standard of silver (11 oz. 2 dwt. to the lb. troy) was identical with that of the silver coinage, and silversmiths found it cheaper to melt down crowns and half-crowns than to make their own alloy, with the result that a large quantity of coins was withdrawn from circulation. The first step taken by the Government to combat the tactics of the silversmiths was typical of the unscientific methods habitually employed by Governments in those days to help declining industries, methods of which we need only recall the law, made at a time when the wool trade was languishing, that every corpse should be buried in a woolen shroud. The Government of William III., with the object of "encouraging the bringing of silver-plate to the mint to be coined and remedying the ill state of the coin of the realm," enacted that no person keeping an inn, tavern, alehouse, or victualling house, or selling wines, beer, or any other liquors by retail, should publicly expose to be used in his house any wrought or manufactured plate whatsoever or any utensil or vessel thereof except spoons, under penalty of forfeiture. The same statute also forbade the export of molten silver in bars without a certificate from the Court of Lord Mayor and Aldermen of London certifying that the bullion was foreign bullion, and that no part of it had been coin, clippings of coins, or wrought plate. No attempt was made to interfere with the use of silver-plate by the general public. In fact, the idea of regarding the members of "the trade" as distinct in the eye of the law from ordinary citizens is very ancient.

A customer calling at a twentieth-century licensed house would doubtless be surprised if his liquor were served in silver, but vessels made of that metal must have been extensively used in such places in the days of William and Mary, or no useful purpose could have been served by the Act, the only effect of which was to hamper the manufacture of silver-plate. The statute was followed by the

one mentioned by "Bypasser," the preamble of which sets forth that silver coins had been melted down into vessels of silver and other manufactured plate "by persons who regard their private interests more than the public good." Hence, raising the standard of silver-plate to 11 oz. 10 dwt. per lb. troy, this Act put a stop to the practice of melting the coinage. It has never been really repealed, but it was incorporated in various Acts for establishing provincial Assay offices, and is still recognized by them, and silver-plate is being sometimes made to that standard. By reason of the small proportion of copper which it contains such silver is softer than is desirable for working-up, but it is, of course, more costly than that of the other legal standard. The purpose of the Assay offices is to protect the public from paying for silver-ware which has been debased by the undue admixture of an inferior and cheaper metal. They are not concerned if a maker employs a greater proportion of silver than he is required to do.—*The Ironmonger.*

Neutrol* and Its Value in Regenerating Silver Plating Solutions.

By S. Shoeld.†

When a cyanide solution stands in the air, it slowly decomposes on account of the action of the carbon dioxide in the atmosphere, into carbonate and free hydrocyanic acid. The latter evaporates. The cyanogen content of the bath will thus decrease and must be replenished. This is generally accomplished by the addition of potassium cyanide once in a while, say one or two ounces to each gallon. The use of hydrocyanic acid for this purpose is absolutely useless because it cannot decompose potassium carbonate.

Through the use of potassium cyanide the bath will accumulate carbonate and the gravity of the solution will increase. As a matter of fact, the higher the amount of carbonate in the bath, the higher must the free cyanide be kept. That is, to cover up the action of the carbonate, the amount of free cyanide in the solution must be increased. The electrical conductivity of potassium carbonate is considerably lower than that of potassium cyanide.

The most ideal method for correcting the cyanide content of a bath is by the use of barium cyanide (Neutrol). It will react according to the following formula:

Potassium Carbonate plus Barium Cyanide
equals
Potassium Cyanide plus Barium Carbonate

The barium carbonate formed is insoluble and separates out. The barium cyanide converts the potassium carbonate into potassium cyanide again and leaves the insoluble and inert barium carbonate. There is no foreign substances introduced into the bath at all. The barium carbonate settles to the bottom of the solution.

Through the action of barium cyanide three or four times a year, one can keep plating solutions in constant composition and gravity. Barium cyanide is especially suitable for silver plating solutions and for gold baths if they do not contain phosphates.

The barium cyanide is called by the trade name of "Neutrol"' and is manufactured for sale by the William Berkel Chemical Works, 683 Communipaw Ave., Jersey City, N. J.

*"Neutrol" is a 20.5% solution of barium cyanide.

†With the William Berkel Chemical Works, Jersey City, N. J.

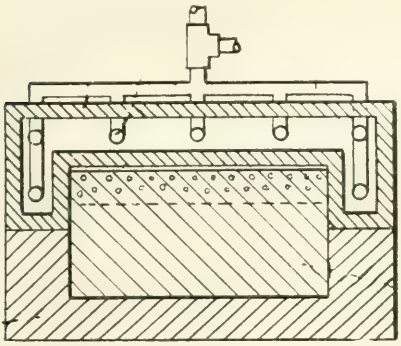
Standard for Commercial Platinum.

The following item from the *Keystone,* October 1912 indicates that the extensive use of platinum in jewelry has created the necessity for establishing a standard for this metal. Up to this time no standard has been fixed.

New York, October 3.—A committee appointed by the National Jewelers' Board of Trade met on September 27, at the headquarters of the board, 15 Maiden Lane, to consider the question of the marking of platinum. After a lengthy discussion regarding a definite standard for commercial Platinum which will hold in law, the conclusion was reached that commercial platinum must be composed of metal 950 1000 fine and embracing only metals of the platinum group, of which metal 65 per-cent must be pure platinum. Of the remaining 35 per-cent not more than 30 per-cent of any one metal of the platinum group must appear. The remaining 5 per-cent was allowed for all other members of the group.

Preventing Piping and Segregation in Metals Cast for Rolling.

All metals to be rolled are cast in metal molds. Cast-iron is almost exclusively employed for this purpose and when of the right kind it is very satisfactory. In casting metals in these molds several difficulties are encountered. The casting "pipes" at the top By this is meant the shrinkage which follows in the cooling and the shrink hole penetrates the top of the cast metal to a considerable depth. This difficulty is caused by the fact that the metal in the mold cools from the bottom and the top, being the last to solidify, contains the shrink hole. Another difficulty is segregation, caused by slow cooling and the difference in specific gravity of the various metals in the metal or alloy.



Benjamin's Apparatus for Casting.

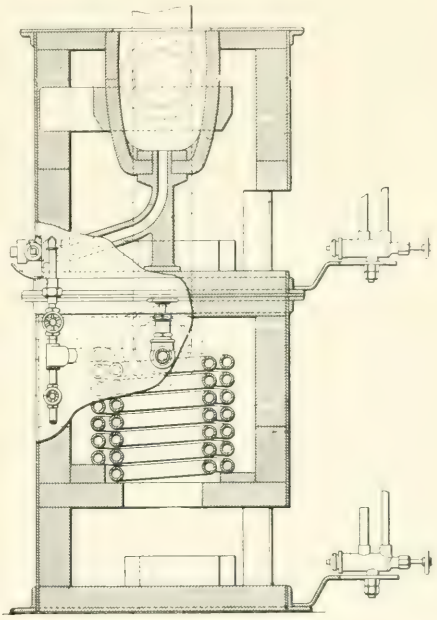
George H. Benjamin of New York City, the well known patent attorney, has recently patented a form of mold for casting metals for rolling which, it is stated, overcomes these difficulties. The principle of the mold is in the fact that one side of the mold is heated while the others are cooled, or one side is chilled while the others are hot. One side of the mold may be water-jacketed as herewith illustrated, or any other means used to cause considerable difference in the temperature of the various sides of the mold. The uneven rate of cooling, it is stated, overcomes the formation of the pipe in the top of the casting.

Although previously considered insoluble in sulphuric acid even when boiling, it has been shown that platinum is actually soluble to a slight degree and boiling sulphuric acid dissolves appreciable amounts from vessels in which it is heated.

An Apparatus for Atomizing Soft Metals.

A Canadian inventor has constructed a form of apparatus for atomizing zinc, lead or tin without oxidation and the formation of very fine powder of these metals.

The metal is melted in a crucible heated by an oil burner. The bottom of the crucible contains a pipe leading to a nozzle and this



Apparatus for Atomizing.

nozzle is a part of the atomizing device. Under the crucible is a coil, through which steam is passed. The coil is heated by an oil burner and the steam is thus superheated.

The steam passes to the nozzle at the point where the tube from the melting pot ends, and the whole apparatus at this point is in the form of a large atomizer. The soft metal flows from the nozzle and the steam, superheated and under pressure, atomizes it with the production of a fine powder.

The inventor, James M. Neil of Toronto, Canada, states that the apparatus is particularly applicable to the production of zinc dust.

Streaks on a copper deposit produced in an acid copper solution are caused by the use of too strong a current.

The Joining of Metals.*

By Alex. E. Tucker.

The author, in his introduction, states that the methods in practical use for joining metals may be divided in the order of their importance as follows:

1. By metallic cements, such as tinman's or brazing solder.
2. By autogenous fusing.
3. By the use of a cementing metal under pressure, generally that of a rolling-mill, and at ordinary or only slightly raised temperatures.

In the first method the fusion point of the solder must be lower than that of the articles to be joined, and as the higher the melting point the stronger the solder, it is desirable that the melting point of such solder or brazing spelter should be only a few degrees less than that of the metals to be joined. The solder should also have, if possible, the same characteristics, such as malleability, color, and hardness.

In joining such metals as britannia metal and pewter very fusible solders must be used; these generally contain bismuth, and the flux used is tallow or olive oil, or its equivalent; further, the workman will effect the joint by directing a stream of hot air on to the parts, in this way greater control of heat being obtained.

Tinman's Solder

In the use of tinman's solder care should be especially taken to avoid the presence of zinc, which thickens the solder and forms a superficial scum which the ordinary spirits of salt is incapable of dissolving. Antimony is frequently present, and by forming a cement of higher tensile strength, may, under special conditions, make a joint of greater strength. In the use of solder the correct method is to raise the work to the highest temperature that the solder and the work will stand, because the penetration of the solder will be better, and the soldering medium may then be squeezed out to the maximum from between the surfaces by suitable means, thus giving a stronger join. Additional strength may be given to the work by rubbing the surfaces carrying the liquid solder together; and it is always well to rub the soldering iron, when possible, over the work when it is used, the "wetting" of the surfaces being then more perfect, and the stripping of the solder prevented. In order to obtain a lower melting point in tin solder, bismuth, and sometimes cadmium, is added. Such solders are used for delicate work, as is occasionally required for electrical fittings.

Bicycles in which the tubing was fixed in the lugs with soft solder instead of ordinary brazing have stood every test; and if the lugs are carefully machined to only a fraction larger than the tubes this method is preferable, because all the metals employed in brazing and tinman's solders destroy the character of the steel if they are heated sufficiently with it.

When soft solder is used the thin gauge tubing is not so likely to be spoiled by deteriorating action on the steel, or by being oxidised at the heat necessary for brazing; and the greater liquidity of the soft solder causes it to sink into the small annular space between the lugs, etc., and the tubes more completely than can be expected with the more viscous flux and brazing solder. The reasons that soft solder is not used for such work are, first, because the heat of the enamelling stoves makes its use risky; and , secondly, popular prejudice.

Soldering bits, in which a bunsen-burner connected with a light flexible tube is employed to heat the bit, and the flame can be conveniently made to heat the work as well, have many advantages. One of the best fluxes for ordinary soldering can be easily made by macerating flux skimmings from galvanising pots with weak hydrochloric acid. Solder in the form of granules or strips of various sizes is very convenient for routine work—*e. g.* spectacle frames—the work being heated in a muffle or on a metal plate by a gas flame or spirit-lamp. Brass tubes are often made by bending the strip through dies, and fixing a wire of suitable composition in the overlap with borax, or the borax may be mixed with finely granulated spelter. The work is passed through a furnace at red heat, the flux is then dissolved off, and the tubes are finished by drawing through dies.

The best brazing (*e. g.* turbine blades) is done with "silver solder." Various silver alloys are used, but they are generally about 60 of silver, 23 of copper, and 17 of zinc, the flux used being borax, or borax and carbonate

*Abstract of a paper presented at Meeting of the Institute of Metals, held in London, England, Sept. 25th, 1912.

of soda. Such a mixture is remarkably liquid when in the molten state, and penetrates interstics which ordinary brazing spelter would fail to fill.

Brazing Solder

The composition of ordinary brazing solder ranges within wide limits: from 61 to 33 of copper, and 39 to 67 of zinc. The tin may vary from nil to 14 per cent., and the lead from nil to as much as 3 per cent. The higher the percentage of copper the higher the melting point, and the higher the percentage of tin the lighter the color.

In brazing iron and steel the importance of purity is very much greater, the presence of even 0.5 per cent. of tin in brazing solder intended for bicycle frames being very injurious.

A brazed joint may be made by connecting the two parts to be joined with the terminals of a suitable dynamo; and if suitable brass wire is wrapped around the tube (a cycle frame) and the whole surrounded with a reducing gas, such as hydrogen or coal gas, a very perfect joint is obtained without any borax or other fluxing medium.

Liquid Brazing

The parts to be joined are dipped in a bath of molten brazing spelter, the metal being prevented from adhering to the other parts by coating them with blacking.

Under the Simpson patents tools are made in which the cutting part is a small piece of high speed or other steel, while the shank is mild steel or iron, a bar of square mild steel being taken, and a channel planed or milled out on it in which a suitable square piece of high-speed steel fits. The two or three sides being clean, strips of copper are fitted in with a special flux, and the whole highly heated to the fusing point of the copper.

According to an English patent recently issued, nine parts of powdered plaster of Paris are mixed with one part of sawdust and ground together and the compound then forms a good material for cleaning tin plates from grease and dust. A good polish is likewise produced, it is stated.

A bright surface on galvanized wire may be obtained by excluding air from the zinc coating as the wire issues from the galvanizing bath. This is done by subjecting it, for a few inches of its length, to an inert gas, such as steam.

The Effect of Beer on Aluminum.

According to a German brewing periodical, the use of sheet aluminum for making fermentation tuns for the manufacture of beer is making steady progress. For four years these tuns have been under observation in a fermentation cellar and show no signs of injury by chemical action. The authors of the paper in this journal state that they obtained plates from these tuns and submitted them to systematic tests. The plates were suspended in ordinary fermentation tuns for several months and gained in weight owing to the formation of beer scale. This scale consisted mainly of calcium phosphate and upon treatment with nitric acid the scale was removed leaving the aluminum unaffected.

Similar results were obtained by suspending aluminum plates in the fermentation tun, but only partially immersed. These results, however, were obtained with cases of pure chemical action as it is known that any galvanic action produced by contact of the aluminum with copper or brass will corrode it. Towards moisture and air the aluminum seems less resistant and undergoes a sort of rusting precess with the formation of patches of white and mossy oxide of aluminum. For this reason, the authors recommend the coating of the outside of the aluminum tuns with lacquer to protect them from this oxidation. The inside which comes in contact with the beer needs no such protection. It is also stated that investigations have shown that hard rolled aluminum is more susceptible to oxidation than the soft metal.

Acetone is a good solvent for pyroxylin (soluble gun-cotton used in the manufacture of lacquers), but is soluble in water. Lacquer containing it, therefore, unless it is present in quite a small quantity, is apt to turn white in damp air while drying.

Silver does not oxidize on melting and the surface, if the metal is pure, is perfectly clear at all temperatures. Unlike the majority of other metallic oxides, silver oxide is decomposed by heat oxygen gas is given off and metallic silver remains. This explains why silver is not oxidized when melted.

Questions and Answers.

QUESTION No. 1211. Is it customary to remove sand cores from valve castings and similar work by tumbling or a hydrofluoric acid pickle? We mean, of course, the sand that is left in the casting after getting the main part of the core out, and not all the core,

Answer. In casting valves, it is customary to blow the cores out while the castings are hot, by dipping in water. The rest of the core can then be knocked out. For cheaper work, the water rolling barrel is used, but it dents the surface. Pickling is rarely used for removing core sand from the interior as it is slow and rather expensive. It is frequently used to remove sand from castings that have burned on the surface.

QUESTION No. 1214. Our nickel plating solution seems to be in bad order. The deposit runs in streaks and burns on the edges. It did not formerly do this and we think it contains too much acid. We have not changed the current in any way and the amount of work plated is practically the same. What do you think is the cause? The solution now stands at 9° Beaumé.

Answer. Your difficulty lies in the fact that the solution is too strong. It should stand from 5 to 6 degrees Beaumé. With a solution of the strength of yours, the conductivity is increased so that more current passes and the edges of your work burn. All you need to do is to add water to your solution to bring it down to about 5 or 6 degrees.

QUESTION No. 1215. We were much interested in reading in the August, 1912 issue of THE BRASS WORLD, *Question No. 1175* in which it is asked about the use of boron for purifying sterling-silver. In this article you say:—"We are unable to give you much information about the use of boron in purifying sterling-silver. It has not yet been placed on the market. It is said to give good results in deoxidizing copper, and as it is the copper in sterling silver which causes the difficulty in making sound castings, it is quite probable that the boron would likewise act beneficially in silver and copper alloys".—We believe that boracic (boric) acid would materially assist in deoxidizing and purifying the copper as it has no affinity for gases of any kind and would not affect the metal. What is your opinion?

Answer. While boracic acid is beneficial in purifying copper, its action is that of a flux and not of a deoxidizing agent like boron. The action of boracic acid is that of protecting the copper from oxidation and gas absorption by melting and acting as a liquid covering. Boron, however, has a reducing action and reduces the oxide and combines with gases present. Its action, accordingly, is entirely different from that of boracic acid. The latter, of course, has the same action as borax. Since the aforesaid question was answered, it has been demonstrated that boron acts very beneficially in purifying copper, but nothing is known about its action on sterling-silver as no experiments have been made. As it has been found that boron suboxide acts similarly to boron and is cheaper, this substance is now used instead of boron for making sound copper castings. The process and the use of boron suboxide in purifying copper have been patented by the General Electric Co., of Schenectady, N. Y. in whose foundry it is used.

QUESTION No. 1216. What can be used for producing a satiny, white and durable finish on steel horse-shoe calks? We are brass plating one variety of them and wish to distinguish between different brands so the other we wish to whiten. We have seen such work on steel and wish to know how it is done. We wish the steel to be protected from rusting. The threads on the calks must not be injured or affect their size. What is the solution to use?

Answer. The white finish to which you refer is a coating of zinc produced by electrodeposition and called electrogalvanizing. It is the best prevention against rust that you can use. It will not injure the threads and the size of the calks will not be affected. The following solution is used:

Water	1 gallon
Sulphate of Zinc	2 lbs.
Sulphate of Aluminum	4 oz.

Use cold and with zinc anodes. The work is cleaned in the same manner that you would use for brass plating.

QUESTION No. 1217. What would you consider the best metal for bearings of wood working machinery and weighing from 6 to 8 lbs. each? These machines run 8,000 revolutions per minute.

Answer. Genuine babbitt-metal used in a bronze shell is excellent and is extensively used. If, however, you desire to use a straight bronze, the following is one of the best mixtures:

Copper	80 lbs.
Tin	8 lbs.
Lead	10 lbs.
5% Phosphor-Tin	2 lbs.

Use no zinc at all in the mixture.

QUESTION No. 1218. What would be a fair thickness in silver plating such goods as electric fixtures? I desire to know what thickness of deposit, in thousandths parts of an inch, we ought to figure on obtaining in order to get a good piece of work without unnecessary expense.

Answer. We have never heard of determining the value of a silver deposit in this manner. It is always determined by weight. Measuring the thickness on the average work would be very difficult and in addition to this

there is never the same thickness of silver upon the different parts of a plated article. The portions nearest the anode would receive more silver in thickness, while those away from it would receive less. Measurements of the thickness taken at the nearet portions would be too high, while those taken upon the parts furthest from the anode or in a pocket or depression would show less. The fallacy of using such a method, therefore, is readily apparent. The only satisfactory method is to weigh the article before plating and then after the silver has been deposited. Scales, so that the silver may be weighed while the electrodeposition is going on, are used in the manufacture of flat-ware, but are rarely used on other kinds of work.

QUESTION No. 1219. Is there any publication that will give us the cost of making fine brass castings such as those used on chandeliers, gas-fixtures, electrical-fixtures, etc? Many of these are false core work and the work is comparatively small and is made in carrying quantities. The work is high grade and is made in limited amounts. We are quite anxious to get at the approximate or accurate cost on the work so we can determine how our own costs compare.

Answer. Unfortunately, there is no book published that will give you the information you desire. It would be quite difficult to compile any accurate information upon this subject as the character of the pattern, local labor conditions and wages would have an important bearing upon the problem. The character and shape of the pattern would have more bearing than any other factor. You will readily realize, of course, that a long, light piece, taking a large flask and considerable sand, although it might weigh but a few ounces, would cost very much more than one of the same weight but short. Many jobbing foundries now refuse to quote prices upon work except for each piece. In other words, they make a separate price on each pattern. This is the only safe way to figure costs of molding for jobbing work.

QUESTION No. 1220. I am having difficulty in oxidizing copper plated work. The copper, when oxidized with liver of sulphur, has a gray and smutty appearance and does not look like good oxidized copper. Before oxidizing, the copper deposit has a sort of pinkish color. What is the cause of the trouble?

Answer. We should say from your description of the color of the copper deposit that you had zinc in your copper solution. This will cause a pink deposit like a light bronze. The fact that your oxidized copper is smutty indicates some or all of the following:

1. You are leaving the work in the liver of sulphur solution too long.
2. The liver of sulphur solution is too strong.
3. Your copper deposit is too light and the liver of sulphur takes it off.

What to do to remedy the difficulty you can easily determine. If, however, you do not remedy it, the presence of zinc in the solution (how it entered it we cannot say) should be investigated.

QUESTION No. 1221. I am making tin foil and bottle caps and desire to learn how to make chemical analyses of the different materials used. Do you think it is possible to learn the art of making chemical analysis by mail? Or could I obtain text books and learn it myself?

Answer. We doubt very much whether you could make much headway in learning chemical analysis by mail. It is possible, however, but very difficult for the reason it is not entirely a theoretical science, but much of it is manipulation. Learning it without personal instruction is similar to learning engraving, glass-blowng or other practical operations without a teacher.

QUESTION No. 1222. We have cast some yellow brass plates in our brass foundry in New Zealand. They are 36 x 42 inches and 1 inch in thickness. We cast them flat from end with two risers, one at the center and one at the end. The metal was ordinary yellow brass. When these plates were bored in the machine shop, they came asunder and we had two plates, 36 x 42 inches and ½ in. thick, just as if we had stopped pouring and then started in again when the metal was set. Can you give us the cause of the plates splitting in this manner?

Answer. The cause of the splitting of the plate was its shrinkage. It was simply a large shrink hole in the center, but on account of the shape of the plate, took the form of an elongated hole which caused the plate to come apart. It is a very common difficulty. You can overcome by the use of large risers (not small ones that cool before the plate) at each end. Gate in the middle. The risers, cooling last, will feed the casting and prevent shrinkage. If, however, the risers are too small, they will not do any good.

QUESTION No. 1223. Can aluminum be oxidized successfully so as to obtain a black color on it the same as copper and silver can be treated?

Answer. There is no satisfactory method for oxidizing aluminum and the best method of coloring it is by means of a dead or glossy black lacquer. These are now made particularly for such a purpose.

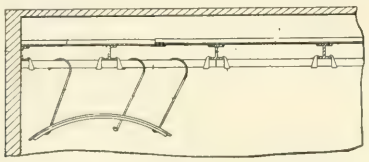
QUESTION No. 1225. Some time ago we noticed illustrated in THE BRASS WORLD, a wire cloth basket for holding pieces of anodes which could not be used in the regular way. Where can such a basket be purchased?

Answer. This basket is not sold. You can easily make one. We do not know of its being used for any metal except silver. Take your pieces of silver anodes and simply wrap them up, so to speak in iron cloth. Then use this package for the anode. Iron wire cloth and not copper or brass must be used. As it is difficult to obtain iron wire cloth that has not been galvanized, the zinc on the galvanized wire cloth can be removed by muriatic acid. Use a pickle composed of equal parts of muriatic acid and water.

Patent Abstracts.

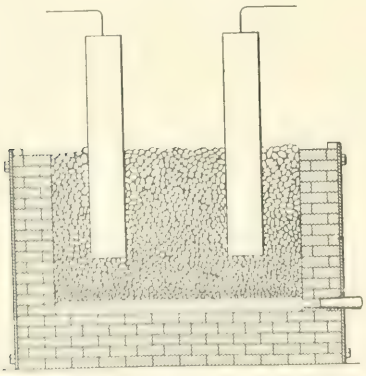
1,037,234, Sept. 3, 1912. BRAZING COMPOUND. Jay Dell Ge Bott of Onalaska, Texas. A compound for brazing iron, steel, silver and other metals. It consists of Muriatic acid, 8 oz.; zinc, 4 oz.; rain water, 1 pint; sal-ammoniac, 3 oz.; rosin, 3 oz.; and cochineal, 1 oz.

1,037,910, Sept. 10, 1912. REMOVABLE CEILING FOR ENAMELING OVENS. George William Hizer of Detroit, Mich. The ceiling is used in the ovens for baking enamel such as that used on bicycles, automo-



bile parts and similar work. The object is to prevent soot and dust from falling on the work. As the ceiling may be removed and cleaned, these difficulties are obviated to a considerable degree.

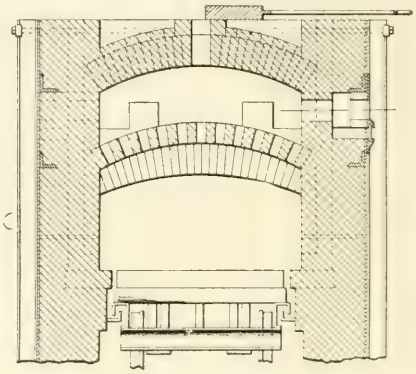
1,041,072, Oct. 15, 1912. PRODUCTION OF ALLOYS. Charles A. Hansen of Schenectady, N. Y. Assignor to the General Electric Co. of the same place. A method of producing ferro-boron and avoiding the admixture of carbon. Boracic acid, oxide of iron and coke and pitch are mixed in a ball mill in suitable proportions. The mass is then heated in an



electric arc furnace of the type illustrated. It is claimed that this method causes the ferro-boron to melt out of the mass and sink to the bottom of the furnace where it can be tapped off. The necessity for a carbon lining of the furnace or the attacking of a silicious material used for the same purpose is avoided.

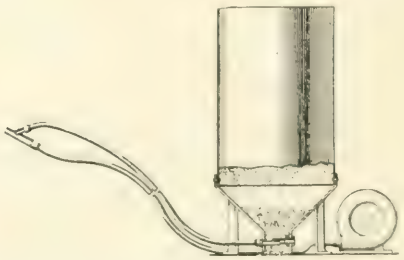
1,040,812, Oct. 8, 1912. TUBE ROLLING MILL. Henrich Stüting of Witten, Germany. The novelty of this mill is in the use of a separate stripper and weight for operating same, for each tube so that undue force is not applied to any one tube.

1,039,801, Oct. 1, 1912. FURNACE. Wirt S. Quigley of Rockaway Park, N. Y. A furnace for annealing or heat-treating metals. The invention applies particularly to "over-fired" furnaces and the essential feature lies in the means employed for controlling the temperature. Heretofore, a rise in temperature could



be obtained only by closing the oil burner or other source of fuel supply. The control is obtained by a relief passage in the top of the furnace which may be opened or closed as desired.

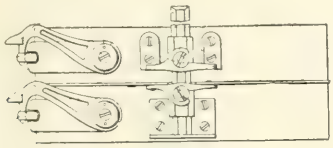
1,039,840, Oct. 1, 1912. SAND BLAST MACHINE. John J. Strasser of Chicago, Ill. The novelty of this sand blast lies in manner of mixing the air blast and the sand. This is accomplished at a point in the nozzle instead of in the sand reservoir. The sand is with-



drawn by the suction of the air blast and a better mixing is thus obtained, it is stated by the inventor. The invention also comprises a novel means for permitting the air to enter without loss of sand.

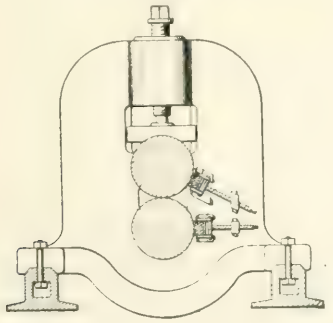
1,039,861, Oct. 1, 1912. PROCESS OF MAKING NICKEL SALTS AND RECOVERING THE ACID USED. Horace L. Wells of New Haven, Conn. Assignor of two-thirds to Mary H. King of East Orange, N. J. A process for making nickel salts, preferably the sulphate from nickel matte. The matte is treated with dilute hydrochloric acid which dissolves the nickel, cobalt and iron, leaving the gold, platinum and other metals undissolved. The iron is precipitated by ammonia and the cobalt by oxide of nickel. The nickel chloride is then evaporated with sulphuric acid to form the sulphate of nickel, and ammonium sulphate is added, if desired to form the double nickel and ammonium sulphate. The hydrochloric acid is recovered by condensation.

1,041,292, Oct. 15, 1912. SNAP FLASK FOR MOLDING. Charles Jurack of Milwaukee, Wis. The flask is more particularly adapted for the molding of small articles. The novelty of the flask lies in the latch and latch hook



which is capable of being rotated to hold the parts of the flask in position. The claim is made that small work is as easily made as with the regular iron flask with pins at the side.

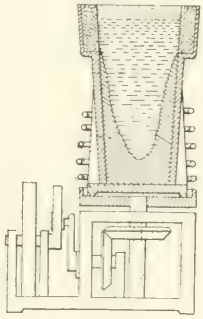
1,040,759, Oct. 8, 1912. APPARATUS FOR GRINDING AND POLISHING ROLLS. Matthew H. Richards of New Castle, Pa. An apparatus for grinding and polishing chilled or steel rolls without removing them from



the housings. It is claimed that the rolls can be ground without the formation of ridges and that the appliance is adapted for use on tin-plate mills more particularly.

1,039,713, Oct. 1, 1912. ETCHING MACHINE. William E. Eaton of Sag Harbor, N. Y. A machine for making a design on a metal plate by engraving or scratching through the wax upon the surface of the plate. This process is the first used in etching and the inventor has constructed a machine so that intricate designs may be traced by the point through the wax. The plate to be etched is first coated with a suitable wax, placed under the point and the design traced through it. The point is guided by a master design so that any number of plates may be engraved. The etching of the plate, after tracing, is accomplished in the regular manner.

1,040,517, Oct. 8, 1912. PROCESS FOR CASTING MOLTEN METAL INTO MOLDS. Clay Crawford of Toledo, Ohio. Assignor to O. S. Brigham of the same place. The metal is cast in a mold and then revolved. This is accomplished by placing the mold on



a revolving pedestal so that it may be rotated when the pouring commences. It is claimed that segregation and other imperfections in the metal are avoided. The process is applied more particularly to steel.

1,040,972, Oct. 8, 1912. PLASTIC METAL. Charles Lee Alexander of Charlotte, N. C. A method of making sponge gold (although the inventor states the process is applicable to other metals). The gold in fine state is treated with a soft wax to prevent adhesion of the particles and this is used in dentistry.

1,040,699, Oct. 8, 1912. ALLOY AND PROCESS OR PRODUCING SAME. Isador Ladoff of Cleveland, Ohio. A method of producing an alloy of iron and titanium and which consists in mixing the oxides of iron and titanium with carbon and subjecting to a temperature of from 600 to 800 degrees C. It is claimed that the titanium is thus reduced at this low temperature on account of the first reduction of the iron.

Trade Items.

The Chandler Company of Springfield, Mass., manufacturers of name plates and metal goods, are to erect a two story factory 42 x 77 feet.

The Chadwick Brass Company, Ltd. has been incorporated in Hamilton, Ont., Canada with a capital stock of $800,000 and is to erect a foundry plant in that city.

Land has been purchased in Brooklyn, N. Y. by A. Schrader's Son, 32 Rose St., New York City., manufacturers of tire valves and gauges. This plot is 100 x 200 feet and is on Clermont, Atlantic and Vanderbilt Aves. A factory will be built on the land and will replace the factory in New York and the warehouse in Brooklyn. It is stated that about 1000 hands will be employed.

The Munning-Loeb Company of Matawan, N. J., manufacturers of electroplaters' and polishers' supplies and equipment, have recently issued their Bulletin No. 200 on "Buffing and Polishing Wheels". This Bulletin is an extensive and well compiled catalogue of thirty-five pages, well illustrated and in which the uses of polishing and buffing wheels are described. The Bulletin contains much useful information and will be sent to those interested.

Ground has been broken for an addition to the office of the Ellwood Ivins Tube Works, Oak Lane Station, Philadelphia, Pa., manufacturers of seamless tubing in all metals. This addition will give them double their present floor space in their office. More furnaces are also being added to their plant and their business on seamless steel tubing has grown to large proportions. They have obtained a reputation in this class of work for accuracy and high class work. They are the only manufacturers of tool steel tubing, which can be hardened and tempered, in the United States.

Franklin S. Cobb has purchased the plant, stock and business of the New Era Lustre Company of New Haven, Conn., the well known and extensive manufacturers of lacquers and their allied products. Mr. Cobb will conduct the business under the old name and will give the trade his personal and undivided attention as in the past. The trade will have the benefit of his experience and judgment as in the past and an even higher grade of goods will be made. Connections have been made for a constant source of supply of amyl-acetate and refined fusel-oil with which the lacquers will be made. Very prompt deliveries can now be made and prices will be cheerfully quoted and samples sent whenever desired. Any class of trade from the smallest user to the largest can now be taken care of. The manufacture of the lacquer is looked after by competent chemists. A New York office in charge of A. E. West has been opened at 50 William St.

The Ideal Clock Manufacturing Company has been incorporated in Meriden, Conn. The officers are: President, Joseph Petrillo; secretary, Dr. A. L. Abitable; and treasurer, Frederick Nadile.

The Ashcroft Mfg. Co., of Bridgeport, Conn., have recently placed on the market a new gauge for measuring the thickness of sheet metal or other materials. This micrometer is of the dial type and measures up to 0.11 inch. It is different from anything yet manufactured for measuring sheet materials.

The Owen Equipment & Mfg. Co., of New Haven, Conn., manufacturers of the "Sentinel" gas soldering-iron heaters and "Sentinel" gas foot torch valves, have opened a branch sales and showroom in Chicago, Ill., at 106 South Jefferson St. A full line of the goods manufactured by this company will be exhibited, and on sale.

At the regular meeting of the Board of Directors of the Joseph Dixon Crucible Co., of Jersey City, N. J., action was taken upon the death of their vice-president William H. Corbin and the following officers were elected: President, George T. Smith; vice-president, George E. Long; treasurer, J. H. Schermerhorn; assistant-treasurer and assistant-secretary, Albert Norris. Mr. Long has held the position of treasurer heretofore and Mr. Schermerhorn was formerly assistant-secretary Harry Daily remains secretary of the company.

The present officers of the National Metal Stamping & Mfg. Co., of Newark, N. J., formerly the Tea Tray Company, are as follows: President, G. A. Kruttschnitt, formerly president and general manager of the Aluminum Goods Mfg. Co.; vice-president and treasurer, James C. Coleman, formerly treasurer and secretary of the Aluminum Goods Mfg. Co.; and secretary, Howard G. Hull, formerly secretary of the Tea Tray Company. The works of the company are at Mulberry and Murray Sts., Newark, N. J.

On and after November 1st. the name of the Tea Tray Company of Newark, N. J., will be changed to the National Metal Stamping & Manufacturing Co. The Tea Tray Company was started in that city in 1867 by Walter C. Conger and has several times changed hands since that year. The company first made serving trays coated with japan, hence the name. The process was new in this country at that time and was, it might be said, first developed in the United States. In 1872 other lines were taken up which consisted of lamp and gas fixture shades. The growth of the company has been rapid and steady and electric street lighting fixtures, phonograph horns and chemical fire extinguishers were added to the list of goods manufactured. The object of changing the name was to enable the company to become better identified with the trade in the line it makes.

The Globe Machine & Stamping Co., of Cleveland, Ohio, has commenced the erection of an addition to their plant in that city. It will be used for a sherardizing department. This company recently moved to their new plant at West 78th St.

An amended bill for the modification of the gold and silver stamping act has been introduced in the Canadian Parliament. This is intended to overcome some of the obstacles and unsatisfactory clauses in the bill passed some time ago and now in operation in Canada. It is expected that the amended law will prove more equitable to manufacturers than the present one.

The largest abrasive wheels ever made were recently ordered from the Carborundum Company of Niagara Falls, N. Y. They are for use in grinding the springs of automobiles. The wheels will weigh 1400 lbs. each and will be 30 inches in diameter with a 12 inch face. They are 1½ inches thicker at the hub so that a safety-collar can be used on them when in operation. They will be used on a 4 inch spindle.

The new foundry of the United Foundry & Machine Co. of Bridgeport, Conn., has practically been completed and the company are now moving from their temporary quarters in the old Burnham foundry to the new plant. The new foundry is located at Connecticut and Bruce Aves. This plant is large and modern and every appliance that will assist in turning out high grade work has been installed. The manufacture of aluminum, brass and bronze castings is carried on.

The General Bakelite Company, 100 William St., New York City, manufacturers of Bakelite and its products, recently brought suit against the Condensite Company of America and several users of "Condensite". Among the latter are the Dickenson Mfg. Co., of Springfield, Mass., the Duranoid Co., of Newark, N. J. and Harman & Wright of Belleville, N. J. The General Bakelite Co. also announce that the fundamental patents on the manufacture of this material have been allowed in Germany and have been sustained by the German Patent Office, notwithstanding the fact that there have been several public contestations.

The new plant that is to be erected by the Southern Aluminum Company at Whitney, N. C., will be one of the largest in the world and will assist in taking care of the rapidly extending increase in the consumption of aluminum. It is expected that inside of a year that the plant will be sufficiently under way so that some 25,000 tons of aluminum per year can be produced. The company was recently incorporated under the laws of New York with a capital stock of $8,000,000, and was organized by some of the largest producers of aluminum in Europe. The work at Whitney is in charge of Dr. Paul Heroult, one of the pioneers in aluminum reduction and an authority on electric smelting and the reduction of aluminum.

The Aluminum Products Company has been incorporated in Detroit, Mich. with a capital stock of $15,000 to manufacture aluminum articles. Joseph Sillman is the principal stockholder.

The Gustave Fox Company of Cincinnati, Ohio, manufacturing jewelers, have equipped an electroplating room and their plant was recently enlarged for this purpose. The room will be in charge of Charles Fischel of Providence, R. I.

The Chicago branch of the National Electroplaters' Association is planning for a large open meeting and banquet to take place in the near future. It is expected that it will take place on the second Saturday in December and prominent men will be present. The Chicago branch is making rapid growth and has proved of much assistance to platers in that city.

The new factory buildings of the Electrical Utilities Co. Ltd., at New Hamburg, Ont. Canada is nearly ready for occupation. A brass foundry will be a part of the plant. This company recently organized with a capital stock of $40,000. The manufacture of telephones and telephone accessories, motors, fans and electrical appliances will be carried on. The president of the company is James Fowler and R. F. Smith is the secretary.

The M. G. M. Manufacturing Company has been incorporated in Detroit, Mich. with a capital stock of $200,000. The manufacture of special brass foods and air compressors is to be carried on. A factory is being erected at 1532 Fort St. West and which consists of a machine shop and foundry, 100 x 128 feet and of brick construction. The officers of the new company are as follows: President, H. R. Haberkorn; treasurer and general manager, Douglas McCracken; secretary and consulting engineer, C. A. Milne.

The William Berkel Chemical Works, 683 Communipaw Ave., Jersey City, N. J. are placing on the market a solution of barium cyanide for regenerating silver and gold plating solutions. It removes the potassium and sodium carbonates in them and renders them in the same condition as when new. There is then no need of throwing these solutions away as they can constantly be regenerated. The solution is called by the trade name of "Neutrol" and information will be given upon request.

The W. S. Rockwell Company, 50 Church St., the well known furnace engineers, have just issued their catalogue of "Rockwell Semi-Automatic Furnaces" for annealing, hardening, tempering, heat-treating and other miscellaneous operations. These furnaces are intended to fill the gap that exists between the ordinary furnace used for such work and the continuous rotary or conveyor type. They can be used, therefore, upon work that cannot be done in the latter furnace and yet obtain more uniform and rapid results than can be produced with the old type of annealing or heating furnace.

The Dodge Mfg. Co., of Mishawaka, Ind., manufacturers of power transmission machinery are sending out to the trade their new abridged catalogue 106-A-12 which is a sort of a junior edition of their large catalogue and will be sent to those interested.

The C. & C. Electric & Mfg. Co., has purchased the good will, patents and business of the Garwood Electric Co., of Garwood, N. J. and will continue the manufacture of the special lines of electrical apparatus manufactured by this company. It is one of the oldest manufacturers of electrical goods in the United States.

The Aluminum Company of America, aluminum producers and manufacturers, have under consideration the establishment of a plant in Knoxville, Tenn., and will secure power from a hydro-electric plant to be built on the Little Tennessee River at Chilhowee. It is reported that a site will be given by the city of Knoxville.

The Emerson Laboratory of 177 State St., Springfield, Mass. say: "It takes a lot of brass to claim to be an expert in any line these days". Yet they pride themselves that they are expert in the analysis of brass, bronze and copper alloys. They desire the opportunity to tell about it and wish to correspond with people who have any of this kind of work.

The plant, business, patents and good will of the Hawley Down Draft Furnace Co., of Easton, Pa. which recently went into bankruptcy, will be sold at auction on Nov. 22nd. by the trustee. A. D. Chidsey is the trustee. The patents cover those of the Hawley Down Draft Furnace Co. and of the Schwartz Metal Melting Furnaces. The plant is a new one and was recently built, the company having moved from Chicago.

The Turner Brass Works of Sycamore, Ill. manufacturers of hardware specialties, gasoline torches and automobile accessories, have recently constructed an improved pump for their "Turner" gasoline torches. This pump is covered with a patent and is considered a marked improvement in the gasoline torch line. The idea is in the pump plunger which is so made that it can be easily removed, the leather washer oiled, formed and returned without any difficulty, thus rendering the repair and adjurtment of torches an easy matter.

The Stamford German Silver Co., has been incorporated in Stamford, Conn. with a capital stock of $150,000 to manufacture German-silver sheet, wire and rod. A rolling mill will be built at Springdale, Conn., a suburb of Stamford. The officers of the company are: President, Wm. B. Beckley; treasurer and general manager, James W. MacKay; and secretary, George C. Harrison. Mr. Beckley is president of the Stamford Board of Trade and Mr. MacKay was for twenty-five years treasurer for the Seymour Mfg. Co. of Seymour, Conn. Mr. Harrison was formerly salesman for the Bridgeport Brass Company.

The Riehle' Bros. Testing Machine Company of Philadelphia, Pa., have completed the largest screw power testing machine ever built. It is for the American Steel Foundries of Alliance, Ohio and will test up to 1,000,000 lbs. It has two screws.

A new site has been purchased by Thomas Savill & Sons of Philadelphia, Pa., manufacturers of plumbers' brass goods. The location is at Watts and Wallace Sts. and a three story brass foundry and factory is to be built. The present plant is at Eleventh and Wood Streets.

The Baird Machine Company of Bridgeport, Conn., manufacturers of presses, tumbling barrels and an extensive line of similar machinery, are to enlarge their plant in the spring. Although a new one, and apparently ample, they have found it necessary, owing to their greatly increased business, to make this extension.

The business of Humason & Beckley of New Britain, Conn., manufacturers of pocket knives, has been purchased by Landers, Frary & Clark of that city. The plant will be operated as usual, but the office will be moved to that of Landers, Frary & Clark. The Humason & Beckley Company manufacture a high grade pocket knife and have obtained a reputation for first-class goods.

The New Haven Plating & Novelty Co., has been incorporated in New Haven, Conn., for carrying on a fine quality of job plating. John J. Courtney is the president of the company and M. J. Faughnan is secretary. A factory has been equipped at 31-33 Artizan St. and a specialty will be made of fine gold and silver plating. Mr. Courtney was for many years with the W. & E. T. Fitch Company of New Haven, Conn., manufacturers of saddlery hardware, and is an expert plater.

The Oklahoma Tripoli Company, owners of the largest deposit of pure tripoli in the world, are preparing to erect a mill on their property at Peoria, Oklahoma for the manufacture of all classes of tripoli products. This new plant will represent the most advanced ideas in up-to-date machinery, improved methods and labor saving devices. It is expected that the company will be ready within 90 days to offer manufactured tripoli for the trade.

The J. W. Paxson Company of Philadelphia, Pa., the well known manufacturers of foundry supplies and equipment, have recently brought out two new oils for the making of cores. One is called "Pax-Oil" and the other "Ros-Core". The "Pax-Oil" is intended for use in making cores by means of a core machine and takes the place of rosin, making a hard, porous core which burns out at a very low temperature. It makes only one-third of the gas given off by rosin by actual laboratory tests. The "Ros-Core" is used for making large cores and is more economical than flour, pitch or molasses. It will not absorb moisture and will be found exceptionally suited for general core work.

Milliken Bros., Inc. of Mariner's Harbor, S. I., New York, steel manufacturers are to build a new galvanizing plant.

The American Bronze Powder Co., of Verona, N. J., manufacturer of bronze powders, is to build an addition to its plant.

The Dayton Brass Castings Company has been incorporated in Dayton, Ohio with a capital stock of $15,000 to manufacture brass castings. J. D. Platt Jr., is one of the incorporators.

A new office building, 68 x 231 feet is to be erected by the American Brass Co., of Waterbury, Conn. The building will be located on Meadow and Grand Sts., and will consist of three stories and a basement.

The general sales department of the Titanium Alloys Mfg. Co., of Pittsburgh, Pa. has been moved to Niagara Falls, N. Y. where their works are located. An office will be maintained in Pittsburgh, however, and at the old location in the Oliver Building. Charles V. Slocum is the general sales manager.

R. F. Lang, 31 Broadway, New York City, is putting on the market the "Royal Prepared Nickel Salts" for use in nickel plating. These salts are unique and it is possible by using them to produce nickel deposits that are not porous and in one-third of the time consumed in ordinary work.

Geuder, Paeschke & Frey Company, 1591 St. Paul Ave., Milwaukee, Wis., the well known manufacturers of stamped metal goods, have recently placed on the market a device for preventing accidents to operatives of presses. This is fitted to punch, stamping and forming presses and prevents the operative from becoming injured through carelessness.

The Stanley Bronze Co., of Bridgeport, Conn. which has been conducting a jobbing brass and bronze foundry for some time, has now been incorporated with a capital stock of $50,000. The incorporators are Paul L. Miller of Bridgeport, Conn., Charles E. Williamson of Darien, Conn., and Edith S. Young of East Norwalk.

Those who use solder should obtain a pair of solder testing scales from Herman Kohlbusch Sr., 170 Broadway, New York City. By means of these scales the amount of tin and lead in a solder can be ascertained in a few minutes by anyone. Consumers can then find out whether they obtain what they pay for.

Contract has been awarded by the Duplex Metals Co., of Chester, Pa. for an addition to their coating department. This building will be 100 x 100 feet and will contain two 25,000 lb. and four 10,000 lb. furnaces for melting copper. These will be of the rotary type. Two additional 10,000 lb. furnaces will also be installed in their present coating department. Two continuous heating furnaces are also to be built. Motor drives will also be used on their rolling mill. The manufacture of copper coated steel wire is the product of the company.

A plant is to be erected in the near future by the Twentieth Century Brass Company at St. Peter, Minn.

The Vincennes Novelty Mfg. Co. has been incorporated in Vincennes, Ind., with a capital stock of $10,000 to manufacture metal novelties.

The Northampton Emery Wheel Company of Leeds, Mass. have brought out a new, high speed motor-driven buffing and polishing lathe designed for accurate work.

A new building to be used for a plating department is to be built by the Wadsworth Watch Case Company of Dayton, Kentucky, manufacturers of watch-cases.

A new factory is to be built by the Acme Wire Co. of New Haven, Conn., manufacturers of insulated copper wire. Plans have already been prepared.

The Greenville Brass Foundry has been incorporated in Jersey City, N. J. with a capital stock of $2,000. The incorporators are William J. Maley, Charles W. Montayne and Richard J. O'Reilly.

A two story factory with basement is to be erected by the Guide Motor Lamp Co. of Cleveland, Ohio. This new factory is to be 60 x 130 feet. Automobile lamps are manufactured by this company.

The Edison Storage Battery Co., of Orange, N. J., has had plans drawn for additional buildings at their plant. These buildings will be large and will give the company more than double their present capacity.

The Sheffield Scientific School of Yale University, New Haven, Conn., are to build a new electrical laboratory and which will be of fire-proof construction. The main building will be 76 x 116 feet with an ell 56 x 62 feet.

Davenport & Keeler Inc., of New Britain, Conn., make chemical, physical and microscopic analyses of metals and alloys. They also analyze and test all commercial products including water for boiler use and sanitary analytical work.

Personal.

H. P. Houghton recently in charge of the Cleveland branch of the Bennett & O'Connell Company of Chicago, Ill., has become associated with Chas. F. L'Hommedieu & Sons Co. of Chicago in the capacity of salesman.

Richard H. Sliter has severed his connection with the E. Schroeder Lamp Works of Jersey City, N. J. with whom he has been connected for some time. Mr. Sliter is the very efficient president of the National Electroplaters' Association.

Charles S. Morse, the well known brass rolling mill engineer, announces that he is designing and building the new plant of the Baltimore Tube Works of Baltimore, Md. but will not operate it after completion as has been reported.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.26
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia, 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.10½
Arsenic, Metallic	lb.	.10
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.50
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitrol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.10
Chrome-Green	lb.	.50
Copper, Lake (carload)	lb.	.17½
Copper, Lake, (cask)	lb.	.17¾
Copper, Electrolytic, (cask)	lb.	.17½
Copper, Electrolytic, (carload)	lb.	.17¼
Copper, Castings, (carload)	lb.	.17½
Copper, Castings, (cask)	lb.	
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Flour Spar	lb.	.01¼
Fusel Oil	gal.	3.50
Gold Chloride	oz.	11.75
Gold, Pure	oz.	20.87
Gum Copal	lb.	.30
Gum Guiacum	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iridium	oz.	63.50
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04¾
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	1.16
Mercury, Metallic (Quicksilver)	lb.	.41
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.45
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Satpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Cloride	oz.	23.00
Platinum Metallic	oz.	48.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic	lb.	.05½
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.08
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.62⅞
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.50½
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc, Carbonate, dry	lb.	.19
Zinc, Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.07½

THE BRASS WORLD AND PLATERS' GUIDE

VOL. VIII. BRIDGEPORT, CONN., DECEMBER, 1912. No. 12.

A MONTHLY JOURNAL DEVOTED TO THE ART OF REFINING, ALLOYING, CASTING, ROLLING, FOUNDING AND ELECTRO-PLATING OF ALL THE NON-FERROUS METALS AND THEIR ALLOYS.

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Contents for December.

Aluminum at Low "Heat", Pouring 428
Automobile Radiators, Corrosion of 430
Books, New 444
Brass and Bronze Plating Solutions 437
Brass Melting, Reducing Zinc Loss in 434
Buffing, Difficulty of Removing Scratches by 438
Buffing Rooms, Eating Meals in 430
Clays, Melting Points of 433
Composition Ingot, Making 421
Copper Castings, High Conductivity 419
Copper, New Method of Purifying 436
Electrical Apparatus, Cost of Operating 438
Electrogalvanizing, New Solution for 434
Electrogalvanizing Solution, Sal-Ammoniac in 429
Electroplating, Problems in 443
Fire-Bricks, Melting Points of 432
Hydraulic Castings, Nickel Bronze for 434
Ingot Metals at Works of Whipple & Choate, Making 421
Mold for Casting Type Metals 445
Nickel Anodes, Economical Grade of 433
Nickel Solutions, Sal-Ammoniac in 420
Nickel Supply, Canadian 436
Platinum; the Most Precious of Metals 439
Questions and Answers 448
Silvering Paste 435
Tin, No Substitute for 420
Tinning, Attempts to Cheapen 432
Tubing, Bending 444
Vienna-Lime Cans, Splitting of 431
White-Metal Alloy, New, Cheap 435
Wire by Electricity, Annealing 445
Zinc from Skimmings, Recovering 446

Making High Conductivity Copper Castings.

The extensive demand for copper sand castings in the manufacture of electrical work at the present time, and the probable increase in this demand in the future necessitates calling attention to one requirement which is usually overlooked or not given the attention that it should. It is the fact that, in order to produce copper castings of high electrical conductivity, it is absolutely necessary that the copper used for making the castings be of a similar conductivity.

Many brass founders believe that the material used for rendering the copper of high conductivity serves to purify it completely from all impurities so that an impure copper can be used for the starting point and result in a pure copper of high conductivity. This belief is entirely wrong.

In making copper castings in sand, the matter is one of rendering them sound, and in order to do this some deoxidizing material is necessary. It is the oxygen absorbed that causes the trouble and to offset this, some metal or substance with a stronger affinity for it than copper is used as an addition to the latter metal to take it up and eliminate it, so to speak, from the copper itself.

This deoxidizing material, be it magnesium, silicon, manganese, or any other metal has practically one mission and that is to remove the oxygen. This statement may, perhaps, be modified by stating that with some other materials like titanium, the nitrogen, of any be present, is likewise removed and certain metals like manganese remove the sulphur. The two

most frequently used substances for producing sound copper castings are silicon and magnesium and these apparently only remove the oxygen.

Impure copper such as, for instance, commercial casting copper, contains as impurities, arsenic, iron, antimony, sulphur, lead, and frequently bismuth, tellurium and selenium. When melted, the copper oxidizes to a greater or less extent and when the silicon, magnesium or other deoxidizing material is added, only the oxygen is removed. The other impurities remain and greatly lower the electrical conductivity of the copper casting.

To make copper castings of high conductivity, therefore, it is imperative that the ingot copper used should likewise be of high conductivity. If this point is not heeded, the castings, though they may be sound and solid, will fall short in conductivity. Frequently to a great extent.

Advantage of Sal-Ammoniac in Nickel Solutions.

The standard nickel solution of to-day contains sal-ammoniac, although many platers do not use it but adhere to the old solution containing nothing but double salts. Sal-ammoniac, however, is of great value in a nickel plating solution and should be employed. When used in connection with boracic acid, one of the best solutions known is obtained.

The advantage of sal-ammoniac in a nickel plating solution is threefold:

1. It increases the electrical conductivity of the solution. This means that the nickel will deposit more rapidly at a given voltage.

2. It brightens and whitens the nickel deposit. Why this takes place is not understood, but it has been found true.

3. It causes the anodes to dissolve more readily. This point is very important and is one not generally appreciated.

Sal-ammoniac is a good conductor of electricity, as far as salts are concerned, and when added to a nickel plating solution increases its conductivity according to the amount added. Common salt is also good for an addition but serves the same purpose as the sal-ammoniac. Its electrical conductivity is lower and for this reason it is not considered as good as the sal-ammoniac although many platers use it on account of its cheapness.

As far as the action on the anode is concerned, the use of sal-ammoniac in a nickel plating solution is of great advantage. When present, chlorine is given off at the anode and this attacks the anode, even though it be "hard" (i. e. in the sense that it dissolves in an ordinary nickel solution with difficulty). Chlorine has a strong action on metals and even dissolves gold and platinum. Its action on the anodes is likewise strong. Of course it has no action on the anode unless the current is passing and for this reason the anode dissolves only during the plating; but during such a process, the chlorine causes the anode to dissolve as it should dissolve and feed the solution. By the use of sal-ammoniac, therefore, the anodes can be made to dissolve and feed the solution so as to maintain the right balance of acidity or neutrality. Without it, it is difficult to have the anodes feed the solution properly and there is always a tendency for them to lag in supplying the nickel and the solution thus finally becomes too acid to work well. The use of sal-ammoniac in a nickel solution is of much advantage, therefore, and its employment is advocated.

No Substitute for Tin.

The present high price of tin brings to our mind the fact that there is no substitute for this useful metal in practically all of its uses. The greatest use of tin is in the manufacture of tin plate. Think of the enormous consumption in tin cans used for containing food. There is no substitute for them.

In bronze and composition castings there is no substitute for tin and it must be used to obtain the desired and absolutely necessary casting qualities and hardness. Solder cannot be made without tin and this material has an enormous consumption in many lines of trade. Tin resembles copper in the fact that there is no substitute for it and it seems to be a fact that we could scarcely get along without it.

The value of all the gold produced in the United States from 1782 to the end of the year 1911 is estimated at $3,358,403,500. The value of the silver produced in this length of time is given at $1,620,072,000.

The Manufacture of Composition and Yellow-Brass Ingot at the Works of Whipple & Choate.

The consumption of ingot metals has increased to a remarkable degree within the past five years and has been brought about by the appearance of high grade material upon the market. Ingot metals of former times, made of anything that came to hand, full of iron and loaded with an excess of lead, not only failed to fill the requirements of brass founders, but served to ruin the business and fill the consumer with suspicion and misgivings. The final result was the inevitable and the sale of ingot metals dropped to a very small consumption compared with that used at the present time. The bad results obtained by the majority of brass founders from ingot metals purchased on the market resulted in a wholesale condemnation of such materials and even now it is not difficult to find many who still have their prejudice against it and will not purchase it at any price. They may have lost customers by it and their experience was so costly that they cannot outgrow it, and still prefer to use new metals even at the higher cost.

It was not until a good grade of reliable ingot metals began to be produced, that brass founders ceased to become suspicious and would use them in place of new metals. As soon as a few founders started to use them, their competitors found that unless they too employed them, they could not compete, until now the element of uncertainty and suspicion is rapidly disappearing. The reason for this apparently radical change is the fact that ingot manufacturers now make what the brass founder wants and adjust their mixture to his needs, give him an honest metal, free from iron and other impurities so that he can make just as good castings as can be produced with new metals and at a less cost.

Fig. 1. Main Foundry Building of Whipple & Choate, Bridgeport, Conn.

The question is frequently asked, why brass founders purchase ingot metals already mixed when they can make the same from new metals and know exactly what they have and free from any uncertainty. The answer is a question of cost. No ingot manufacturer ever dares to pretend that he makes his ingots from new metals. If he does, then one should be suspicious of him for it is a simple matter to figure out the cost of brass or composition made from new metals. If this is claimed and he is selling below the actual cost of the new

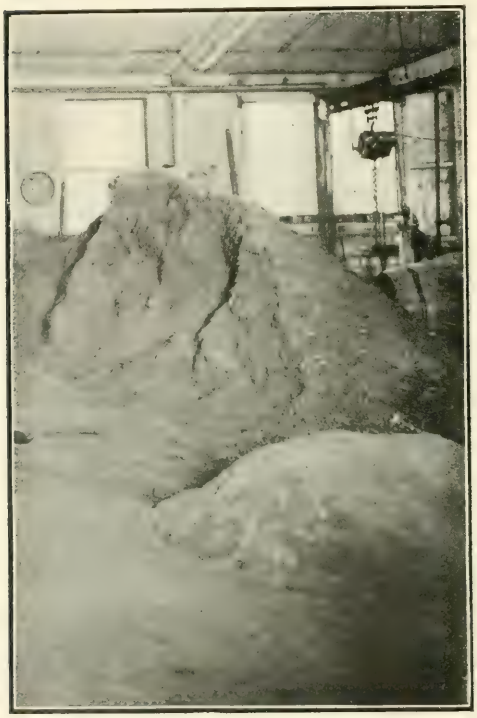


Fig. 2. A Large Pile of Yellow Brass Chips to be Put Through the Magnet Machine.

metals in the mixture, then one can readily ascertain that he is lying. As far as known, no reputable ingot maker ever attempts to claim that his mixtures are made of new metals. Scrap is always used, and the reason why ingot metals are purchased by brass founders is that they are cheaper than when made of new metals. This fact and this alone is responsible for the present magnitude of the ingot trade. The use of scrap has made it possible. Without it, the business would not exist. The present condition of the ingot metal trade and the high character of the ingot produced at the present time are brought about by the methods now in use for treating scrap metals so that they can be brought up to the new metal standard. Copper is copper and tin is tin, no matter whether in new or scrap metals. If, therefore, an ingot metal made from scrap contains exactly the same metals as that made from new metals, it is equally as good. The chemist has made this possible. Without him, the manufacture of ingot brass and composition would be a matter of great uncertainty and uniform results would not be obtained.

Among the first to appreciate the fact that the ingot metal trade was in a state of decay, were Whipple & Choate of Bridgeport, Conn. They early discovered that the aversion of the brass founder towards ingot brass and composition was caused by having had very low grade metals forced upon him. Iron was always present to a large extent in the form of shot or small particles not skimmed off and when the castings made from the metal were machined, the tools were ruined. In addition to this, lead was added to the ingot metals to such an extent that the castings not only lacked strength but the lead would separate out while cooling was taking place. Again, different lots of metal varied in copper and zinc contents, and, therefore, were not uniform. Appreciating these facts to the fullest extent, Whipple & Choate believed that if a good, honest ingot metal which was uniform from day to day was supplied the brass founder at a price lower than he could make the same material from new metals, a good business could be worked up and they set about to do it. The result has been that they are now turning out from twenty-five to thirty thousand pounds of ingot metals a day to customers who use it with the best results.

Through the courtesy of Whipple & Choate it has been possible to follow the manufacture of their ingot metals from beginning to end and to obtain photographs indicating how the metal is made. Both yellow brass and composition ingot metals are made in the same manner, the only difference being in the raw material. In the one case, yellow brass chips are used. In the other, composition or bronze turnings. The melting, casting or other treatment to make them into ingots are exactly identical.

Let the making of the yellow brass ingot be described in detail and when this has been done, one can assume that the composition is made in the same way, without any changes whatever. As the raw material for yellow brass ingot, only one class of material is used and that is *yellow brass screw rod chips.* It may be said that one of the reasons for the success of their ingot has been because they adhered to this class of material. A very large amount of drawn brass rod is now used in making screws and similar articles and the consumption is increasing. This rod is made by the brass rolling mills and each maker uses practically the same mixture. Not only is this the case, but good and pure metals are used in it and the amount of lead used is always the same. The fact that the rod can be rolled and drawn indicates that the metal must be good. When the screws and other small articles are made, there is likewise produced a corresponding quantity of yellow brass chips; and it is these chips that are the raw material used by Whipple & Choate for the manufacture of their yellow brass ingot. They obtain them from the manufacturers who make them and are able, therefore, to obtain a constant and uniform supply.

It should not be imagined that the simple melting of the chips is all that there is to the making of the ingot metals for there are other things necessary. Were this the case, then only two mixtures would be produced. Early realizing that ingot metals must be made to suit the requirements of every brass founder, this firm began by making whatever mixtures might be necessary, until at the present time some forty-five different red and yellow brasses and bronzes are made by them. This is made possible by the fact that

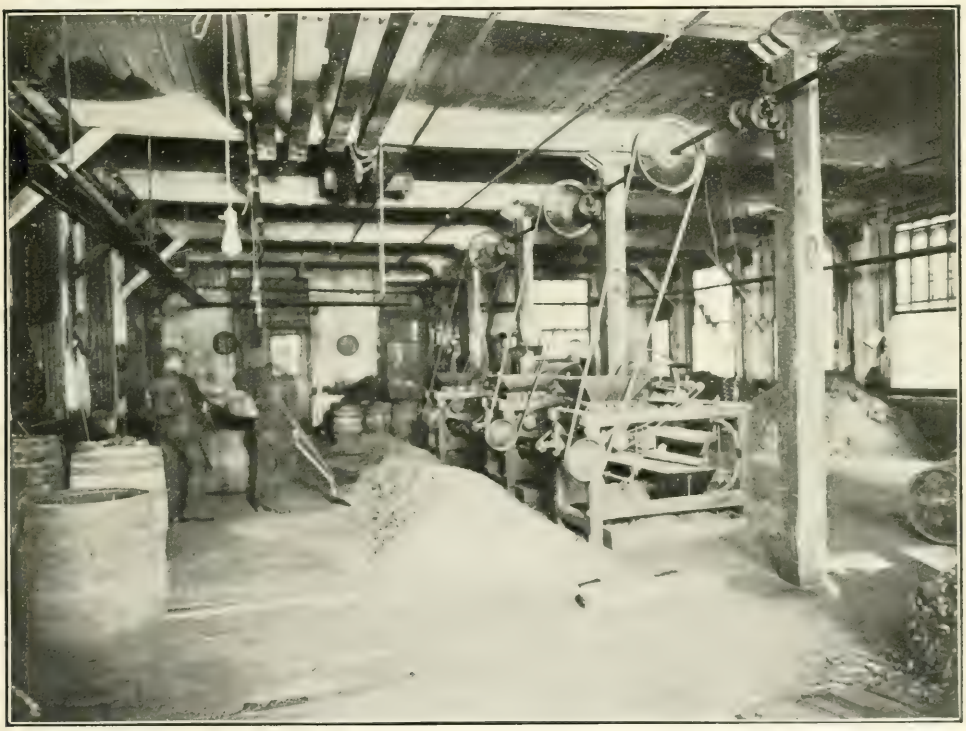


Fig. 3. The First Operation in Making Ingot-Metal or Putting the Chips Through the Magnet Machine.

copper is added to the mixture to render it richer, more tin or lead is added when necessary, or spelter is introduced when required.

The successful production of so many different mixtures to suit every individual case, is made possible by the fact that the mixture of chips used as the raw material is exactly known. In other words, a known starting point is had and the other mixtures built up from this. The old hap-hazard method of

making ingot metals and which caused so much trouble is thus avoided.

Putting Through the Magnet Machine

The first treatment of the chips after they have been received is to remove any iron, that may be present in them, by means of the magnet machine. Iron is always present no matter how carefully the chips may have been looked after in the mill that made them. The statement is often heard: "We machine no iron or steel at all in our mill and our brass chips are absolutely free from iron". Put such chips "guaranteed" free from iron through a magnet machine and watch the result. Broken drills, taps, wire and other foreign material will be found in them together with more or less iron or steel chips. Every plant which has screw machines has a machine shop and this is the source of the iron or steel chips. It is unsafe, therefore, to assume any chips free from iron and Whipple & Choate have adopted the practice of putting *everything* through the magnet machine so as to avoid any danger whatever. Even copper wire is tested with a hand electromagnet to find copper plated wire or that now on the market known as "duplex" and consists of a steel core and copper covering. They have found the hand electromagnet run by the electric light current very serviceable as it enables a workman to ascertain at once whether iron is present in a bundle of copper wire.

Immediately after being received, the chips are put through Dings magnet machines for the removal of the iron. The quantity of chips put through may be appreciated when it is known that eight Dings machines are in daily operation. In Fig. 3 some of these machines are shown and the amount of iron obtained from them is surprising. The old method in use at the time when there was such a prejudice against ingot metals, was to melt the chips down without magneting. The result can easily be realized.

Fig. 4. Shoveling the Pile of Chips Over by Hand in Order to Mix Them and Make a Uniform Lot.

The chips are piled up near a magnet machine and in such proximity that they can be shoveled by a workman into the hopper with little exertion. Such a pile is shown in Fig. 2. When the chips have been put through the machines they are found free from any mechanical admixture of iron or steel and this is one of the most essential features of the making of ingot metals. Iron in the chips is in the form of small particles that is never skimmed off, but enters the ingot metal, then in the castings made from it and finally makes its appearance when the castings are machined. Those who have encountered iron in this form well know how disastrous it is to tools.

Standardizing the Chips

The fundamental principle of ingot metal manufacture is to know what is had at the start. This knowledge is one of the modern improvements in such manufacture and has been responsible for the success of this class of trade. A maker is then able to guarantee his customer an ingot of known mixture and this is what he invariably wants.

Chips may vary in mixture to a sufficient extent to affect the ingots made from them. Frequently yellow brass chips are mixed with some composition or two kinds of brass are intermingled, such as for example screw rod chips and drillings from sheet. These admixtures do not injure the chips in any way, but the final mixture is variable. The "standardization" of the chips is carried out to guard against any variation.

After the chips have been put through the magnet machines, they are mixed by workmen in the manner shown in Fig. 4. This operation is carefully done in order to render the pile of uniform and homogeneous mixture. In other words, a large pile of chips is desired which will be uniform from top to bottom and this can be obtained by careful hand shoveling as indicated in Fig. 4. When this has been done the chips are ready for chemical analysis and testing.

Analyzing and Testing

When the pile of chips has been completely

Fig. 6. Pouring Yellow Brass Ingots from the Crucible.

Fig. 5. Pulling a Crucible Out of the Furnace.

mixed, it is necessary to make a chemical analysis of it in order to ascertain the exact composition of it. Completely mixed in a homogeneous pile as it is, any small sample taken from it will represent the whole and a chemical analysis of it will also indicate the exact mixture of the lot. This chemical analysis is always made and it is the fundamental principle of the whole operation of ingot making. In addition to this, a sample is melted down and the ingots examined. One of the common impurities in metals at the present time, when made from scrap, is aluminum and extra precautions are taken to prevent any such contamination. If the chemical analysis shows any aluminum, the chips are rejected and are not used. The melting of the small sample and examining the surface of the ingot are likewise a check upon the chemical analysis as aluminum makes its appearance in a marked manner. If present in considerable quantity, the surface of the ingot will be smooth. Small amounts are revealed by smooth patches, while the rest is rough.

The complete analysis of the pile of chips is made in order to determine their exact mixture. If, therefore, it is found that a customer desires the mixture in them with the exception that there is too little lead, then they are simply melted and sufficient lead added to make the required amount. If, however, the mixture lacks copper, then sufficient heavy copper wire is melted with them to bring up the percentage to the desired quantity. Tin is added when necessary and it will readily be appreciated that any desired mixture can be produced by using the chips as the base and adding whatever metals are necessary. It is impossible, however, to remove any metals present and in this connection it may be said that brass foundry mixtures are very rarely desired which do not contain lead and this is the only metal in the brass chips which might not be required. In case it is, the quantities are small and the mixture will have to be made from new metals. It is very rare indeed that any mixture is required that cannot be made from the yellow brass chips as a base.

Melting the Chips

It has been found that in order to sell an ingot metal at a price that will show a profit, the melting loss must be kept down and for this reason melting in crucibles is necessary. At the works of Whipple & Choate crucibles are used for the melting and a mixture of anthracite coal and coke is employed for the fuel. No flux is used, but care is taken to keep the heat as low as possible in order to prevent the loss or volatilization of the spelter. Not only does this loss of spelter mean loss of money, but it affects the mixture. If the spelter burns out of the brass, the customer receives more copper than he pays for, but the metal is not as good for his purpose perhaps, for the reason that it may be too soft. It is possible, with care and good melting facilities, to keep the melting loss to 5 per cent. In the furnaces, natural draught is used. In Fig. 5 one end of a battery of furnaces is shown. Some thirty furnaces taking No. 150 pots are used and each furnaceman melts 5000 lbs. per day. He has one helper to assist him. The pots are pulled out by a chain block and run to the ingot molds by means of a trolley-track. This method, which avoids the use of a jib-crane, has been found very satisfactory.

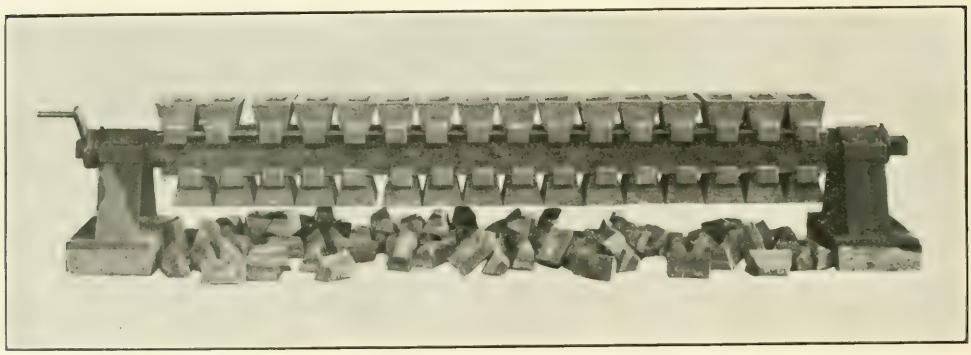


Fig. 7. Revolving Ingot Molds Designed by C. N. Choate.

Pouring the Metal

The pot of metal is poured into the molds in the manner indicated in Fig. 6. The molds used are of the ordinary gray-iron type and are held in a unique device designed by C. N. Choate of the firm. In Fig. 7 a closer view of this device may be seen. The molds are provided with a dovetailed foot which holds them in place. Two sets of molds are used and are placed on a frame swung on trunnions thus constantly being balanced. At one end on the trunion shank, a wrench is placed and by means of which the apparatus is turned over. When one side of the molds has been poured and the metal has set, the apparatus is turned over by the wrench and the ingots dumped out. The other side is then ready for pouring. In this manner, one side is always ready. The apparatus has proved very satisfactory and has been in use for some time.

surface will have the appearance shown in Fig. 8. While the metal poured at either heat will be good, the appearance is not and this consideration is an important one when the customer is to be taken into consideration. It serves to prevent any suspicion and the only way the character of the metal can be judged outside of a chemical analysis or actual use is by the appearance.

Small Ingots

It is frequently surprising how a little thing will cause a great change. This is in the case of small ingots. One of the obstacles the brass founder of former times had to encounter was large ingots. It was not infrequent that ingots weighing seventy-five pounds were found on the market. This, of course, was an extreme case, but ingots weighing twenty-five or thirty pounds were not un-

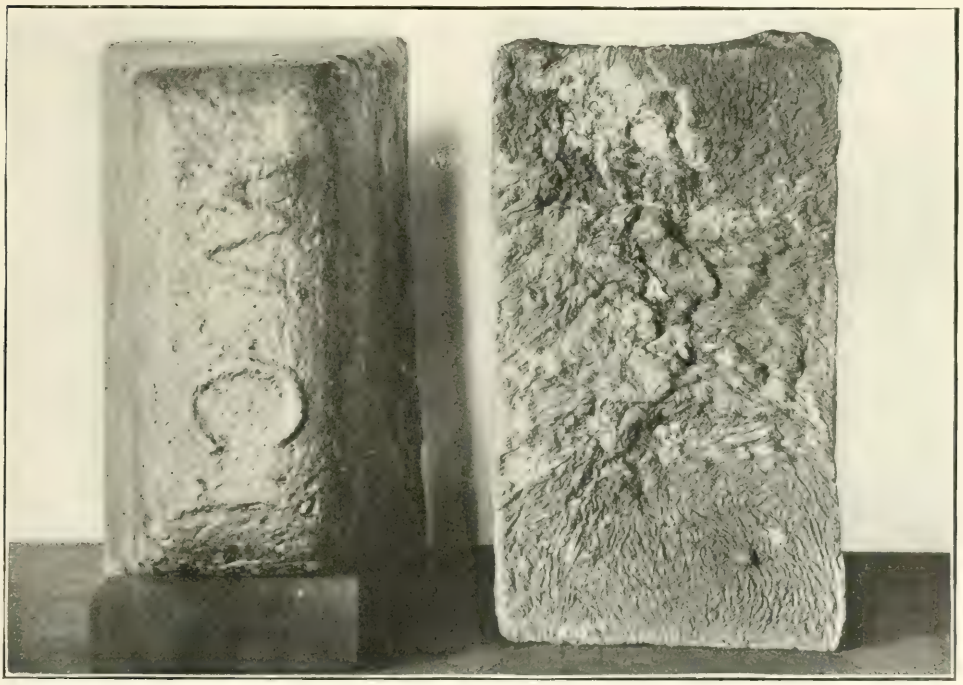


Fig. 8. Top and Bottom of a Yellow Brass Ingot. Shows the Normal Surface of a Good Ingot.

Much care is necessary in pouring the ingots at the right heat in order to obtain a good surface on them. If poured too hot, the surface will be oxidized and covered with white oxide of zinc, and if poured too cold, the appearance will be "mushy". At the right heat, the ingot

common. Such ingots require less labor in pouring and handling and hence were cheaper to make. They are, however, too large for use as the average brass founder uses a small pot and if he were able to get the ingots into the pot at all, they projected above the top,

oxidizing when the melting was taking place and filling the crucible so full of metal that there was no room for any gates or other form of scrap.

Whipple & Choate early appreciated this fact and started to make small ingots. A pile of such ingots is shown in Fig. 9 and the bottom and top of a single ingot in Fig. 8. The advantage of these small ingots will easily be understood and every brass founder will appreciate their serviceable quality at a glance. The old fashioned ingot, long, heavy and with a notch in the middle is bound to become a thing of the past. The notch was originally used to allow breaking, but this frequently was difficult with tough metals and requires extra labor. By the use of small ingots, this operation is avoided and melting is rendered easier for the brass founder.

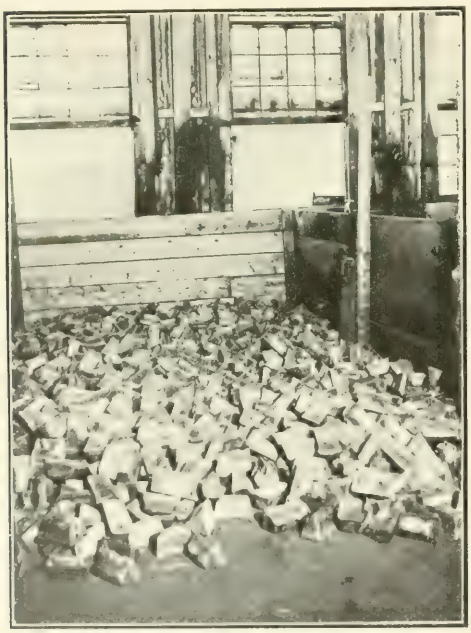


Fig. 9. Yellow Brass Ingots Ready for Shipment.

It is apparent, from the method employed in making ingot metals at the works of Whipple & Choate, that their success has been brought about by giving the brass founder what he wants and maintaining it in a uniform manner from day to day or month to month. Their method of making their ingot, it will readily be seen, is free from any secrets, but consists in constantly maintaining an honest mixture of an absolutely uniform nature.

Advantage of Pouring Aluminum at a Low "Heat".

H. W. Gillett of the Aluminum Castings Co. of Detroit, Mich., recently carried out an elaborate series of experiments on the effect of the pouring temperature on the strength of aluminum castings. These results were published in the Transactions of the Eighth International Congress of Applied Chemistry and from which we have obtained the data herewith given. The following information is printed:

The tensile strength of aluminum alloys is greatly influenced by the size of the constituent crystals or as the foundry calls it, "closeness of grain". The finer the grain, the stronger the metal.

In some fifty-three experiments made, the bars used for testing averaged nearly 20% stronger when poured cold than when poured hot. Exceptions were the alloys of aluminum containing 2% of manganese and also the ones containing 5% of magnesium. The manganese alloy has such a low elastic limit that it is seldom of commercial use. The alloys with magnesium oxidize so readily when melted that it is difficult to make castings that do not contain dross and hence become weak.

It is stated by Mr. Gillett that the aluminum alloy consisting of 92% of aluminum and 8% of copper is the one most extensively used at the present time for making sand castings and easily ninety per-cent of all the aluminum castings made are produced by the use of this mixture.

The addition of small amounts of manganese, titanium, iron or antimony to the aluminum and copper previously mentioned increases the strength of the casting when poured hot, while nickel, chromium, cadmium or bismuth seem to be without much influence. Any of these elements, however, cause brittleness and decrease the resistance to impact.

The heat of the bars poured hot, averaged from 1550° F. to 1900° F. These temperatures, however, were, as previously mentioned, such as to decrease the tensile strength of the cast bars nearly 20 per-cent. *The best pouring temperature for the 92% aluminum and 8% copper mixture, as well as the other commercial alloys, was found to be about 1225° F.*

Use of Sal-Ammoniac in an Electrogalvanizing Solution.

The electrodeposition of zinc is not a difficult operation but for years it was not attempted commercially. It has long been known that zinc could be deposited the same as other metals and almost like copper. It is possible to employ the sulphate of zinc as the electrolyte, in the same manner that sulphate of copper is employed in making an acid copper solution. On the other hand a cyanide zinc solution can be employed by dissolving carbonate of zinc in cyanide according to the same method used in making a cyanide copper solution. On account of the cost and the slowness with which the zinc is deposited from a cyanide zinc bath, it is rarely used. The sulphate of zinc solution is the one almost exclusively employed and it deposits its metal rapidly and is as cheap as any that can be made. It is not surprising, then, that it is so largely used in electrogalvanizing.

If sulphate of zinc is dissolved in water and used for an electrogalvanizing solution, the results obtained are not satisfactory. To be sure, the solution deposits zinc, but it is rough and when it attains any thickness, warts grow and "treeing" results. It is for this reason that it is not employed alone. For years, it was known that a zinc deposit could be obtained from a sulphate of zinc solution, but the deposit was found unsatisfactory and the method was not used at all. It was not until the discovery was made that certain chemical additions to such a sulphate of zinc would produce a smooth deposit that electrogalvanizing became used at all. From that time on, the electrodeposition of zinc became a commercial possibility until to-day it is very extensively used and the future will see it used still more.

There are various chemicals that can be added to a sulphate of zinc solution to make it deposit its zinc smooth, but some of them are costly and no better than the cheaper ones. One of the best is sulphate of aluminum and this is quite extensively employed. It is cheap and easily introduced. The addition of a small quantity produces the desired result, and it has the advantage that, in case the normal quantity employed is exceeded, no harm results. By this is meant the fact that the amount used need not be exact. If it is within reasonable limits, the results will be uniform.

It has been found that in addition to sulphate of aluminum, sal-ammoniac (ammonium chloride) is an excellent substance in an electrogalvanizing solution as it increases the conductivity of the solution, thus causing the metal to deposit more rapidly at the same voltage, and the anodes dissolve better in the solution. In addition, it is not expensive so that the cost of the solution is not increased to any appreciable extent.

The following solution will be found good for electrogalvanizing and it is in daily use in a number of establishments with good results:

Water	1 gallon
Sulphate of Zinc	2 lbs.
Sulphate of Aluminum	4 oz.
Sal Ammoniac	2 oz.

The solution is made up by dissolving the sulphate of zinc in the water. The water need not be hot, but in winter will dissolve better if it is warm. In summer it can be dissolved in the water at ordinary temperature. After this has been done the sulphate of aluminum and the sal-ammoniac are added. The whole three salts can be dissolved at once if desired as it really makes no difference with the rapidity with which they go into solution.

The solution is used cold (i. e. at the ordinary temperature) but in winter it should not be allowed to go much below 60° F. or the deposition of the zinc will be slow.

The use of a large number of anodes should be emphasized as zinc does not go into the solution very readily and if plenty are employed the zinc is fed into the bath nearly as rapidly as it is deposited. It should always be borne in mind that zinc in the anodes is the cheapest form in which it can be obtained.

The familiar Welsbach mantle used so extensively for incandescent gas lighting consists of a mixture of the oxides of cerium and thorium in the proportion of 99% of the thorium and 1% of the cerium.

The experiment is being tried in Germany for making producer gas from the city sewage. It has been found possible in the city of Hamburg to make gas, but the cost is higher than producer gas made from coal.

The Corrosion of Automobile Radiators.

Nearly all automobile radiators are now made of brass and while satisfactory as far as heat conductivity and durability are concerned, there is always more or less difficulty experienced by makers on account of corrosion occurring in the winter. This is the time of year when one would expect less corrosion to occur on account of the fact that chemical action is retarded by the cold. The fact is, however, that such corrosion is not produced by any defect in the radiator but in the solutions used in them.

It is necessary, in order to prevent the freezing of the water in the radiator and engine jackets of an automobile during the winter, to use some liquid in them which will not freeze at the temperature of the coldest winter night. Drawing off the water has been found impracticable. It is in the use of this solution that the difficulty is experienced, although few automobile owners know of the fact and it is finally laid at the door of the radiator manufacturer who, in turn, may attempt to force it upon the maker of the brass sheet.

There are many so-called "anti-freezing" solutions which, as far as their freedom from freezing is concerned, are quite satisfactory, but when it comes to the corrosion of the radiator are not. Calcium chloride, common salt, and similar substances are exceptionally bad and attack the brass rapidly. Glycerine is quite extensively employed in connection with alcohol and is not to be recommended as unless pure the glycerine decomposes, forming compounds which attack the brass. Common glycerine is not suitable and pure glycerine is quite expensive. The glycerine mixtures in addition to attacking the brass to a greater or less extent, are not favored on account of their action on the rubber connections, and their sticky nature.

Wood alcohol is not attended with satisfaction, when mixed with water in the proportion needed for the prevention of freezing, as it contains many foreign substances which have an injurious action upon the brass. In addition, wood alcohol, in presence of the heat and air, generates formic acid which, of course, attacks brass readily.

The best material for use in automobile radiators is grain alcohol (ethyl-alcohol) and by varying the proportions of water and alcohol any desired freezing temperature may be obtained. For example 20% alcohol and 80% water freezes at about 10 degrees above Zero. A mixture of 30% alcohol and 70% water freezes at about 5 degrees below Zero. If the mixture is made of 40% alcohol and 60% water it will not freeze above 20 degrees below Zero, while 50% alcohol and 50% water freezes at about 35 degrees below Zero.

De-natured alcohol can be used with equally as good results as the pure, grain alcohol and is very much cheaper.

Eating Meals in Buffing Rooms.

At Sheffield Police Court on November 5, Mappin & Webb (Lim.) were summoned for a breach of the Factory Acts in permitting certain female workers to take their meals during the dinner hour in a part of the factory in which polishing on a wheel is carried on.

Miss Sadler, an inspector of factories, stated that she found girls having their dinners in a shop in which buffing—a process which gave off a considerable amount of dust—was carried on. This was contrary to the regulations laid down by the Factory Acts. No other room was provided for the meals and the girls had no time to leave the premises to find other accommodation.

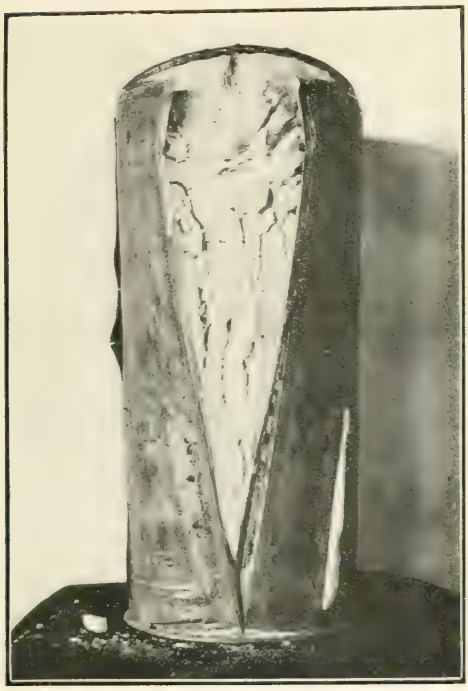
For the defence, Mr. Clegg stated that the regulation said to have been infringed became law eleven years ago, and this was the first prosecution with respect to it. Very little dust was created by buffing, because the powder used was mixed with oil.

The Magistrate said that there was no evidence of much harm having been done. He ruled that the defendants were legally liable, but no blame attached to them, because they told the women not to eat and drink in the buffing shop. The women continued to have their meals there because it was more convenient. He imposed a fine of 40*s.*, and costs, in each of the two cases.—*The Ironmonger.*

No substitute for tin has yet been found and in the bronzes, on tin plate and in solders it must be used or they cannot be made.

The Splitting of Vienna-Lime Cans.

Vienna-lime consists of a variety of limestone called dolomite which has been burned to lime. Dolomite consists of the carbonates of calcium and magnesium. As this variety of lime, after the dolomite has been burned, has a great affinity for moisture while



Vienna-Lime Can Which Split Open on Standing.

stored it must be protected from the air. Strange to say, this so-called Vienna-lime has no value as a polishing composition after it has become "air-slacked", but must be used before it has arrived at this condition. It is customary, therefore, to place the bars or sticks of Vienna-lime, used so extensively at the present time for "coloring" and buffing metals, in tin cans and then hermetically seal them. These cans are the regulation tin-can but of the shape, of course, conforming to that of the Vienna-lime. The seams are soldered like the regulation food can so that no air will get to the lime.

Those who carry these cans of Vienna-lime in stock for any length of time are troubled by some of them splitting open in a manner similar to that shown in the illustration. This does not occur at once and only when the cans have stood for some considerable length of time. The can herewith illustrated had remained several years without appreciable change, but finally a small split could be noticed at the seam and it rapidly grew larger when once started. Then the can expands and the lime slacks and changes to a fine powder and becomes useless. Strange to say, three cans of this brand of Vienna-lime all split open upon standing.

Manufacturers and others who use Vienna-lime as a buffing material do not usually experience much trouble by the cans splitting open as they use them soon after having been received, but the makers of the material frequently experience it. What has caused it has often been perplexing, but when the difficulty is investigated the matter becomes quite simple.

Lime of all kinds, whether made from dolomite or ordinary lime will remain unaltered and unchanged indefinitely if air or moisture is completely kept away from it. If, however, air is allowed to come in contact with it, it slacks. Absolutely dry air, however, has no effect on it, but it is moisture that does the work and all air of the atmosphere contains more or less of it.

The cause of the splitting of the cans containing the Vienna-lime is that they are not absolutely tight. The merest pin hole will allow enough air to enter to start the slacking, and when this begins, the lime expands and thus starts the seam so that more air can enter and the final slacking is thus greatly hastened. The ultimate result is that shown in the illustration.

The whole difficulty is in the soldering of the seams of the cans. While such seams may be soldered absolutely tight, as far as the eye can detect, there may be a minute hole undetected and which will allow enough to enter to slack the lime. The fact that the lime does not slack at once, but only after some time, frequently several years as the can herewith illustrated did, indicates that the hole in the imperfect soldering must have been quite minute. The soldering of such cans so as to make them absolutely tight for all time is not as easy as it may seem.

Attempts to Cheapen Hot-Tinning.

The abnormally high price of tin has caused manufacturers, who carry on hot tinning, to investigate substitutes. Tin has always been a high priced metal, but within the last few years the price has rapidly increased, and the need for some substitute or method of cheapening has been sought. In nearly every instance this has been impossible as the advantage of tinned iron or steel is that the base metal is not only protected but a white, lustrous coating is produced which remains unaltered in the air for a long time.

There are thousands of articles that are tinned and so far it has been impossible to cheapen them in any satisfactory way, as far as the tinning is concerned. The first thing that occurs to the novice is to add lead to the tin. It is possible to tin the iron or steel goods with such a mixture, even when the lead is present to a large amount, but the difficulty lies in the tarnishing quality of the coating. Even with a few percent of lead, the tin will not remain unaltered in the air as long as pure tin, and the color is a little "off". Lead, to be sure, cheapens the tin coating by cheapening the mixture, but it cannot be used if a bright tin coating is desired that will remain permanent in the air for the greatest length of time. Then, too, the hygienic aspect of a tin coating containing lead is to be taken into consideration for the reason that many articles that are coated with tin are to be used in the household or to contain food. Lead then, cannot be used to any advantage except in special cases and these are of small importance.

Various attempts to use zinc in the tin have resulted in failure. The zinc renders the tin more or less "thick" when melted and the coating is not smooth and bright. For this reason it cannot be employed in hot tinning. The use of antimony is attended with the same results although in a less degree. The amount that can be introduced into the tin without causing the lustre to deaden is so small that the use of antimony has no value.

Aluminum has been tried as an addition to the tin, but like the antimony it is of no value as a cheapening material. In addition it prevents to a marked degree, the adherence of the tin and a good coating cannot be obtained.

The result of experiments has been that in order to obtain a bright, lustrous and permanent coating on iron or steel by means of tin, it is necessary to use pure tin. When other metals are added to the tin, the coating is greatly impaired and is then of no more value than a galvanized surface, except in the case of non-corrosive properties. The appearance, however, is such as to prevent the goods from being satisfactory.

In some classes of goods, tinning has been used as a rust-proof coating and the appearance is not of great importance. In some instances of this kind electrogalvanizing is being tried. An example of this nature is bed or furniture springs which have always been tinned for the better class of work in order to prevent their rusting. The use of electrogalvanizing is being tried on such goods and it looks quite promising. As a rust proof coating, the zinc, of course, will be superior to tin if a sufficient coating is put on. This seems to be the difficulty so far.

The Melting Points of Fire-Bricks and Clays.

The *Bureau of Standards* recently determined the melting points of fire-bricks in an accurate manner. The results are of much interest as indicating the commercial value, as far as heat resisting properties are concerned, of the various kinds of fire bricks. The following results were obtained:

	Number of Samples Tested.	*Melting Point, Centigrade*
Fire Clay Brick	41	1555 to 1725
Bauxite Brick	8	1565° to 1785
Silica Brick	3	1700 to 1705
Chromite Brick	1	2050
Magnesia Brick	1	2165
Kaolin	3	1735 to 1740
Bauxite	1	1820
Bauxite Clay	1	1795
Chromite	1	2180
Pure Alumina	1	2010
Pure Silica	1	1750
Carborundum	1	2700

The value of 1750° given for silica is not the true melting point, but represents the temperature at which the silica flows distinctly. It was found that silicon carbide does not melt below 2700 and becomes unstable at much lower temperatures.

What Grade of Nickel Anode is the Most Economical?

The nickel anode question has always been one that has agitated the consumer. Some of them, however, who have investigated the subject have discovered that there is not as much to the matter as generally believed and that the best anode is one which is alloyed and will thus dissolve readily in the solution. There has always been a demand for pure nickel anodes and almost every nickel plater has tried them at one time or another, either a pure cast anode or the rolled. It seems to be the pretty general verdict in the United States that an alloyed anode is the best.

The grade of nickel anode that is principally used at the present time is what is known as the "90-92" anode. This means that it contains from 90% to 92% nickel. The 2% is allowed the nickel anode maker for variation for the reason that he cannot work much closer in his mixtures and be sure of it, but he can make the anode so that it will be within these limits in nickel contents.

The average composition of a 90-92 per-cent nickel anode as made at the present time is as follows:

Nickel	90%
Iron	6½%
Tin	3%
Carbon	½%

It is a mistaken idea that the iron is added to a nickel anode to cheapen it. It is introduced to "soften" it, as it is called, so that it will dissolve readily in the solution. The carbon, introduced in the iron has a similar effect and the tin likewise has the same influence. The price of nickel anodes is always determined by the nickel it contains. The 90-92 grade is cheaper than pure nickel and the customer does not pay for the iron or tin, or in other words, only the nickel is charged for.

The question, therefore, resolves itself into one of what is the best anode? Is the pure nickel anode containing 98% nickel (this is as pure as can be made) or a lower grade containing iron and tin better for nickel plating? The general verdict is that the best grade is one containing 90-92 per-cent. of nickel.

We are indebted to W. S. Stratton, the well known electroplater, for the following experiments conducted to determine the best grade of anode for nickel plating:

Two grades of anodes were used in a nickel plating tank, 4 were of the 90-92 per-cent grade, and 4 of the 98 per-cent grade or pure nickel (pure commercial nickel cannot be obtained much higher than this). The 8 anodes were run for the same length of time and then cleaned. The following results were obtained:

The dust, after drying, from the 90-92 per-cent anodes weighed 1-1/5 oz.

The dust from the 98 per-cent anodes weighed 5-1/5 oz.

The dust from each seemed to be of about the same bulk but that obtained from the 98 per-cent anodes was heavy and granular, while that from the 90-92 per-cent grade was light and fluffy. The dust from the 98 per-cent anodes was composed of heavy, metal particles, while that from the 90-92 per-cent ones consisted almost entirely of carbon and similar light foreign material.

The results of these experiments confirm that which has been found by others, namely that a 98 per-cent anode dissolves with the formation of a granular surface. This granular surface either falls off or is washed off in cleaning the anodes, and being heavy means an actual loss in metal. The dust obtained from the 90-92 per-cent anodes is light and consists mainly of carbon which, of course, represents no loss.

It is apparent then, that the most economical nickel anode is one containing from 90-92 per-cent of nickel for the reason that it dissolves better in the nickel bath and with the minimum amount of waste. The 98 per-cent grade can be used, but the waste is much greater. In the experiments conducted by Mr. Stratton, the waste in the so-called "dust" (which is the coating on the anodes and which has been washed off and dried) was over four times as great in the case of the 98 per-cent anode as it was in the 90-92 per-cent grade. The 90-92 per-cent nickel anodes, therefore, can be used with the least waste and as only the nickel in them is paid for, they are the most economical.

The Netherland Trading Co., authorized by the Dutch minister for the colonies, announces that the quantity of Banca tin to be sold next year has been estimated at 235,000 piculs (31,333,000 pounds).

A Nickel-Bronze Mixture for Hydraulic Castings.

The making of bronze castings to stand hydraulic pressure is a matter which very often perplexes a brass founder. He may be able to make good castings and those which have a fine surface, but when the castings are tested, leakage results. It has been found that a special mixture is better for hydraulic castings than the ordinary composition or the well known 88-10-2 bronze. A casting which has a good superficial appearance may not stand the pressure and for this reason a mixture which has the necessary closeness of grain is required. It is not a question of tensile strength in the castings as this has been found less important than the grain of the metal; and the patterns will be found of sufficient thickness to stand the pressure. Those who design such patterns know well that there is nothing to be gained in making the walls too thin and it is invariably the case that a sufficient thickness is given them. The problem, then, is one of mixture and good foundry practice. Even with the mixture herewith given, poor foundry work cannot be tolerated.

The following mixture for making hydraulic castings has been in use for some time in one of the large foundries in the United States and has proven very satisfactory for this purpose. It has been used on castings which had to stand a pressure of 3,000 lbs. to the square inch hydraulic pressure and for this purpose was found excellent. The mixture is as follows:

Copper	83 lbs.
Tin	5 lbs.
Zinc	5 lbs.
Lead	5 lbs.
Nickel	2 lbs.

The nickel in the mixture is the metal that produces the good qualities for hydraulic work. To make the mixture the nickel should be put into the crucible with a small amount of the copper and the two melted together. Make sure the nickel is melted and keep well covered with charcoal while the melting is going on. Then add the rest of the copper and melt in the usual manner, afterwards adding the zinc, tin and lead. Stir well in order to thoroughly mix the ingredients. The metal is poured at about the same temperature as ordinarily.

Attempts to Reduce the Loss of Zinc in Brass Melting.

In *Metallurgie,** F. Bensel gives the results of some experiments upon the reduction of zinc losses in brass melting. He says:

"The direct addition of zinc to melted copper in a crucible heated electrically produced hardly any alloy as the zinc volatilized and oxidized. Several attempts to substitute an equivalent quantity of zinc blende (zinc sulphide) for the zinc, the copper being in sufficient excess to form cuprous sulphide with the sulphur in the blende, were also unsuccessful. Sodium sulphide was used as a flux. The brass produced never contained more than 12% of zinc and large quantities of both copper and zinc were lost in the slags. Sodium and calcium carbonates used to flux the blende were also unavailing.

Finally, the metals were melted in a closed, egg-shaped furnace through the center of which passed carbon electrodes joined by a rod of resistance carbon. The furnace could be rotated so as to agitate and mix the metals, and had an opening through which the alloy could be poured. There was practically no loss of zinc and the resulting brass was almost exactly the composition (70% copper and 30% zinc) calculated.

The cost of melting a ton of brass was about $1.56 for power (in a furnace melting 100lbs. at a time) and about 56 cents for resistance carbon. The saving in zinc, as compared with the ordinary process of manufacture, may be taken at 62 cents per ton of brass."

*1912, 9, pages 523-531.

New Solution for Depositing Zinc.

According to an English patent recently issued to E. Ballegeer of Brussels, Belgium, the following solution is excellent for the electrodeposition of zinc:

Water	1 gallon
Zinc Chloride	2 lbs.
Sal-Ammoniac	10 oz.
Common Salt	3 oz.
Tartaric Acid	3 oz.

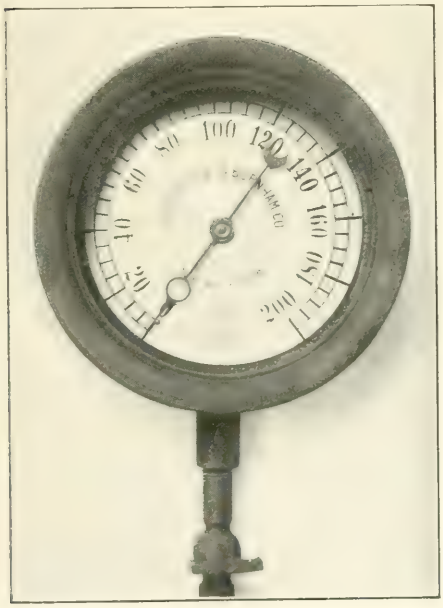
The solution is used cold and with a current density of about 10 amperes per square foot.

Silvering Paste.

The silvering of copper, brass and bronze is easily carried out by the simple rubbing on of the following compound. All that is required is to mix it with a little water, so as to make the compound into a paste, and then rub it on the brass, copper or other article by means of a soft cloth. The silvering compound is made in the following manner:

Chloride of Silver	1 oz.
Cream of Tartar	2 oz.
Common-Salt	3 oz.

The chloride of silver should be quite dry and the other two ingredients mixed with it.



Steam-Gauge Dial Silvered by Rubbing Silvering Paste on It.

The whole mass must then be ground up in a mortar or by other means so that it does not have a granular appearance.

The paste of the three ingredients thus mixed is kept in a dark colored bottle, away from the light. Light decomposes it. To use it in silvering, take a small quantity, just enough for the operation to be done and moisten it with water to form a paste. Then rub it on the article to be silvered with a soft cloth. The surface, if it be brass, copper or bronze, will be coated with a thin film of white silver.

The silver coating thus produced is thin, as one would naturally expect, but it may be used for a variety of purposes. The formula given is not new but has long been known, and is in daily use in a number of establishments. One of the applications of this method of silvering is in the making of steam-gauge dials, clock dials or other forms shown. A sample of such work is shown in the illustration.

The silver produced by rubbing on this paste is not burnished but is rather dead, and as it is white, this fact renders it quite suitable for dial work. The fact that the letters are sunk and filled renders some sort of a paste necessary and the formula given is the one generally used for this purpose. The brass dial is left dead and the silvering paste deposits its silver in a dead condition so that the surface is obtained in an ideal condition for this use. A dead surface of this nature is always more visible than one that is bright for the reason that there are no false reflections given off from it.

The surface of work silvered in this manner should always be lacquered, if possible as it protects the silver from both tarnishing and wear. A white lacquer is used and is necessary for this purpose. Some of the manufacturers of dials use a spirit lacquer made by dissolving bleached shellac in alcohol and applying to the dial warm. This lacquer, however, is no better than the ordinary silver lacquers made from soluble cotton and are much more difficult to apply. The cotton lacquers can be applied cold.

A New, Cheap White Metal Alloy.

A new, cheap white metal alloy containing a large amount of iron has been patented by John F. Duke of Manchester, England (U. S. Patent, 1,044,761, Nov. 19, 1912). The mixture is unique on account of the fact that it contains such a quantity of iron. The proportions claimed are as follows:

Iron	50.30%
Nickel	19.16%
Copper	20.14%
Aluminum	1.45%

It is claimed by the patentee that the mixture is quite non-corrosive and white, and in spite of the large iron content it resists the action of vegetable acids and the atmosphere exceedingly well. If a further hardness is desired, from 1 to 2 per cent of tin is added.

The Canadian Nickel Supply.

It seems unlikely that the Dominion Government will prohibit the export of nickel from Canada except to Great Britain—a suggestion made recently. Prior to the time of war crisis such a prohibition might prove an effective weapon. The official reports of mineral production in Ontario show that in 1910, the latest year for which such figures are available, there were obtained from the nickel-copper mines of Sudbury 652,392 tons of ore, of which 628,947 tons were smelted in the blast furnaces and put through the converters. The product was 35,033 tons of Bessemerized matte, 23.6 tons of ore being thus required on an average for 1 ton of matte. In this quantity of matte there were contained 18,636 tons of nickel; last year's output, 13,141 tons, being exceeded by 5,945 tons, or over 41 per cent. The production of 1910 was much the largest since the nickel mines of Sudbury were opened, a quarter of a century ago, and stamps this field as being the most important source of nickel in the world. The value of the nickel contents of the matte, on the basis of what it is worth —or estimated by the producers to be worth— at the point of production is $4,005,961.

To the output of the Sudbury mines must be added, for the sake of completeness, the nickel contents of the silver ores raised at Cobalt, estimated to amount to 504 tons, bringing the total yield of nickel in 1910 up to 19,140 tons.

The use of nickel for coinage purposes is spreading. In 1909 the Government of Turkey was authorized to put out an issue of coins made of nickel and aluminum. The latter metal, upon being tested, not having given satisfactory results, nickel was decided upon, and it has been resolved to issue 120 millions of 5-para pieces, 120 millions of 10-paras, 70 millions of 20-paras, and 20 millions of 40-paras, in all 330 million pieces. The money is all to be coined in 4 years and issued in 20.

The only other important source of nickel is the island of New Caledonia, whose output, however, in proportion to the whole, is now much less than that of Sudbury. Société le Nickel, whose production is of New Caledonia ores, operates refineries in France, England, and Germany. From 1900 to 1909 the French production fell from 1,700 to 1,200 tons, while that in England rose from 1,500 to 2,800 tons, and in Germany from 1,900 to 3,100 tons. Thus in 1909 the total output of nickel from New Caledonia was 7,100 tons.

The United States Geological Survey states that limited quantities of nickel are also produced in Norway and Germany. The use of nickel is apparently growing, especially in steel and in nickel plating. The use of the recently introduced alloy known as monel metal seems to be growing also. This alloy is produced by smelting the nickel copper ore with no attempt to separate the copper from the nickel. The smelting process is thus made much softer and cheaper, and the alloy can be sold at a lower price than pure nickel. For some purposes it is said to be better than any known metal, as it corrodes less easily than brass or bronze, and in strength compares well with steel.

It has been employed as castings in the manufacture of propellers for vessels, in pump linings, steam turbine nozzles, and valve fittings for superheated steam, in dairy machinery, refrigerating plants, and pickling apparatus in steel mills, in rod form for pump rods, bolt and nut stock, steam turbine parts, stock for drop forgings, electrical apparatus, for roofing railway terminals and other large buildings, smelter roofs, cooking utensils, chemical apparatus, etc. It is also thought it would make an excellent substitute for nickel for coinage purposes.—*Daily Consular Report.*

An Improved Method of Purifying Copper.

Axel G. Sundberg of Helsingborg, Sweden, of the Helsingborgs Kopparverks Aktiebolag of the same place, has patented a method of purifying copper. He blows carbonate of soda underneath the surface of the molten copper by air or gas and, it is claimed, the arsenic, sulphur, and similar impurities are removed.

It is stated that the arsenate of copper that is formed during the refining process, is converted into a sodium salt which forms no alloy with the copper, but rises to the surface as a slag. The amount of carbonate of soda used is very small and it is possible, the inventor states, to reduce an arsenic content of 0.02% to 0.002% by a quantity of carbonate of soda equivalent to one-half of one per cent of the copper treated.

The oxide of copper, found during the melting of copper, dissolves in it, but the appearance of the surface of the melted metal remains clear and unchanged.

Brass and Bronze Plating Solutions and How to Make Them.

Eleventh Paper.

Heavy Brass Deposits

There is a growing demand for heavy brass deposits, particularly on automobile work. Brass plating on this class of articles is always on steel and a heavy coating is desired in order to resist wear. The ordinary brass deposit found on automobile hardware and appliances is of the average kind and of a good commercial quality, but it soon wears off under the influence of the polishing needed to brighten it and keep it clean. Brass plating on automobile work has to undergo the most severe test that can be put to it.

A good, heavy brass deposit is necessary for automobile work. The customer, who purchases the car upon which it is used, expects it to last a reasonable length of time. It usually lasts, when of the ordinary kind, for a few months. High grade and heavy brass plating may last a year.

The production of a heavy brass deposit would seem to be a simple matter and it is really not as difficult as it might appear, but the deposit is not as satisfactory as desired. A brass deposit, when it is thick is also hard and if the article upon which it is deposited is bent, the brass is apt to scale off. This may or may not result in a difficulty. Heavy goods, which will not bend, will retain the brass deposit, but thin ones may cause peeling when bent. The absorption or occlusion of hydrogen during the electrodeposition is the cause of the hardness. This hydrogen occlusion is also a difficulty found in other electrodeposits, and in the case of nickel it has been removed by heating the nickel red hot. The hydrogen gas is then expelled. The same may be true of brittle and hard brass deposits, although it has never been tried, as far as known. It is probable that many brass deposits would blister and peel under such conditions as it is difficult to prevent such trouble from occurring.

To obtain a heavy brass deposit the brass should be plated on as slowly as possible in order to render it as soft as possible. If forced, blisters form and the brass deposit is very hard. A slow deposit means that it will be soft. Soft in the sense of relation, however, to that deposited with a strong current. That deposited with the weak current will be hard compared to soft sheet brass, but it is as soft as can be obtained in depositing the metal. There is nothing that can be added to the solution, as far as known to produce any further softness.

If the brass deposit is only to be of reasonable thickness then the electrodeposition can be allowed to go on without taking the article out of the solution; but if a very heavy deposit is to be used, then it may be necessary to take the article out and scratch brush it with a steel scratch brush or even cut it down on a wheel. These operations, however, are not advisable for the reason that it is difficult to clean the surface afterwards and the brass is apt to deposit in layers.

It is always preferable to give the steel a flash of copper in a hot cyanide copper solution previous to brass plating. This not only renders it easier to obtain a brass deposit that will adhere, but causes the brass to deposit more evenly at the start. The cleaning of the steel work is made simpler by the use of this preliminary copper solution as a slight film of grease or oil, which would prevent the adherence of a deposit from a cold solution is removed by the hot copper solution either by solution or from the gas given off, thus acting like an electric cleaner.

There is a method in existence for brass plating automobile levers and similar articles used on the machine that is not bad at all. It is a combination method and consists in first flashing the steel article in a hot cyanide copper solution, then giving a heavy copper deposit in an acid copper solution and afterwards cutting down and brass plating. It is possible, by the use of the acid copper solution to obtain a heavy copper deposit that is soft and will not crack or peel. To be sure, when the brass deposit wears off the copper is revealed, but this protects the steel against rust. Many automobile manufacturers do not care for this variety of brass plating but it is good and is far better than a simple light brass plate on the steel.

On account of the time taken in depositing the brass, heavy brass plating is rather costly and except on the most expensive work is not done. The average brass deposit is quite thin, although it has the appearance of brass. If there were some solution or method known of

producing a heavy brass deposit without the long time now taken for it, it would be very extensively used, but up to the present time none has been discovered.

The Cost of Operating Electrical Apparatus and Machinery.

Electricity is so convenient and may be used for such a variety of apparatus and machinery, that there is always a desire to employ it for lines of work for which coal or gas is now used. One of these lines is electric heating and for which the electric current has not been employed to any extent. The reason for it is the cost of the current for such work.

The General Electric Co. of Schenectady, N. Y. have issued a booklet on the subject of electric meter reading in which some interesting data upon the cost of operating electrical machinery and apparatus is given. The data is as follows:

Apparatus	*Watts Used*	*Cost per Hour*
20 Candle Power Mazda Lamp	25	¼ cts.
Radiant Toaster	600	6 cts.
Chafing Dish	400	4 cts.
Disk Stove	400	4 cts.
Coffee Percolator	400	4 cts.
6 lb. Flat-Iron	550	5½ cts.
8 in. Fan	25	¼ ct.
Sewing Machine Motor	55	½ ct.
Ice Cream Freezer	400	4 cts.
Washing Machine Motor	200	2 cts.
Luminous Radiator	250	2½ cts.
Heating Pad	44	½ ct.
Tubular Air Heater	1200	12 cts
Tea Kettle	500	5 cts.
Ozonator	75	¾ ct.
Domestic Buffing Motor	55	½ ct.
Radiant Grill	600	6 cts.

The cost is based upon electric current at 10 cents per kilowatt hour which is a fair price for current obtained from central stations. In fact, it is about the average price charged in cities.

The high current consumption of heating and cooking apparatus is noticeable and the low cost of that consumed by machinery.

Difficulty of Removing Scratches by Buffing.

The members of the Birmingham Section of the Institute of Metals held their first meeting of the season on October 22, when Professor Thomas Turner, of Birmingham University, delivered his presidential address. The major part of the discourse was devoted to a consideration of the changes wrought in the structure of a metal by hard working, *i. e.*, by drawing, rolling, bending, or hammering, and also by annealing. He showed that all metals when viewed through a microscope exhibited a cellular structure. It was made up of an infinite number of crystals of polygonal form, and each enclosed within a sheath which formed the crystal boundary. The sheath consisted of the last constituent of the metal or alloy to solidify, and was therefore harder than the crystals enclosed. Upon working the metal by any of the processes mentioned above, the crystals, and the infinitude of smaller crystals of which they were composed, were forced out of their relative positions—were forced to slip upon each others' faces, so to speak—and in that irregular form presented an amorphous appearance. As a result of such working the metal became stronger. The excess of strength might amount to a certain per cent. of the original tensile strength; but seldom or never more. The crystalline structure of a metal might be broken down in other ways than those mentioned, as *e. g.*, buffing and burnishing, the former producing the phenomenon in its soft amorphous phase and burnishing in its hard amorphous phase. It was a mistake to assume that buffing removed file marks. It merely obscured them, by first breaking down the crystalline structure of the metals and then brushing the comminuted crystals into the ruts. If the amorphous material were etched away it would be found that the file marks were still there.—*The Ironmonger.*

A new material for structural purposes is called "Theta Tubing" on account of its resemblence in cross section to the Greek letter by this name. It is claimed that the tensile strength of this tubing is increased from 60 to 75 per-cent on account of its shape. It is claimed to be suitable for air-ships, bicycles, etc.

Platinum; the Most Precious of the Metals.*

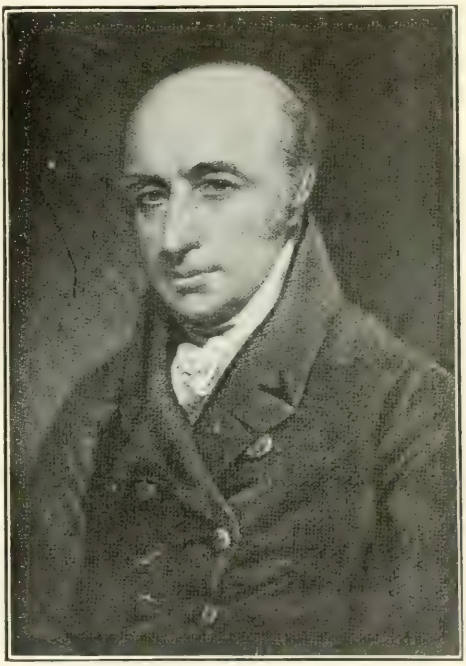
By Harry F. Keller, Ph. D.

Unlike most of the useful metals, platinum remained unknown until comparatively recent times. Probably the earliest authentic reference to it is to be found in a work of Antonio de Ulloa, a Spanish naval officer, published in 1748, and entitled: "A Narrative of a Journey to South American". In this, Ulloa mentions it under the name of platina as a mineral which occurs in the Choco District of Columbia, and which is found admixed with the gold in the district. He describes it as an extremely tough substance that renders gold unworkable, as it cannot be extracted or removed by the ordinary processes.

Specimens of platinum, probably from the same source, were brought to England as early as 1735 by Charles Wood, who obtained them at Cartagena, in Colombia. William Brownrigg, who received some of this material from Wood in 1741, and published a description of it as a metalloid in 1750 (two years later than Ulloa), is now generally credited with the discovery of platinum. For many years it was erroneously ascribed to William Watson.

A more complete investigation of platinum was made by Scheffer, assayer of the Stockholm Mint, and the results were communicated to the Royal Academy of Stockholm in 1752. His material came from the gold-bearing sands of the river Pinto, in Colombia, and he called the new substance "white gold, or the seventh metal, known in Spain as *platina del Pinto.*" Scheffer showed that platinum is a true metal, insoluble in nitric acid, but soluble in aqua regia; also, that it is infusible at the highest temperatures attainable in furnaces but capable of forming fusible alloys with other metals and with arsenic.

Fairly pure platinum was first obtained by the German chemist Margraf, who made the important discovery that solutions of platinum chloride are precipitated by potassium and ammonium salts, but not by sodium salts. He also was the first to prepare spongy platinum. In 1778 the Count von Sickingen communicated to the French Academy the results of his experiments with platinum, in the course of which he found that the metal can be welded, and that it can be worked into foil and wire. A new process of rendering platinum malleable, by treatment with arsenic, was described by Achard in 1784. Macquer and Baumé succeeded in melting platinum in the focus of a powerful concave mirror. But in spite of all the work that was done on platinum during the latter part of the eighteenth century, it was not until the beginning of the nineteenth, and chiefly through the labors of



William Hyde Wollaston, Who Discovered the Method of Making Malleable Patinum.

certain Englishmen, that it yielded to metallurgical treatment and became a commercial product. In 1819 platinum was discovered in the gold placers of the Ural Mountains, and a few years later Russia became the chief source of commercial platinum.

The most important developments in the platinum industry were the perfecting, by Wollaston, of a process of making malleable platinum from the pure spongy metal, and the achievement of Deville and Debray, in 1858,

*Abstract of a paper in the *Journal of the Franklin Institute*, Nov. 1912.

of devising a process by which large quantities of the metal can be melted.

Owing to a rapidly increasing demand and a nearly stationary supply, the value of the metal has enormously increased in recent years, so that during the first decade of the present century the price of platinum has not only surpassed but more than doubled that of gold.

SOURCES OF COMMERCIAL PLATINUM.

While native platinum has been reported from many and widely scattered localities, both of the Eastern and Western Hemispheres, the districts which have produced the metal in commercial quantities are few in number and limited in extent.

As I have stated before, platinum was first observed in the gold placers of Colombia. The river Pinto, from the sands of which were obtained the first specimens that were brought to Europe, is doubtless one of the tributaries of the San Juan in the district known as El Choco. Before the discovery of platinum in the Ural Mountains, Columbia furnished the bulk of the metal of commerce, and, while its production at the present time is probably one-twentieth that of Russia, it still occupies a second place as a platinum producer. It is estimated that Columbia has yielded over 50,000 pounds of platinum, mostly from the San Juan district.

Among the earlier finds of platinum, those made in the gold washings of the island of San Domingo, and especially the province of Minas Geraes, in Brazil are often mentioned. It does not appear, however, that either of these localities has ever contributed appreciably to the world's supply.

It was not until 1819 that platinum was first observed in Russia. In that year small quantities of grayish-white metallic grains were gathered in the gold washings of Verk-Isetsk, in the Siberian Urals. They were not recognized as platinum until 1823. The development of the great deposits at Nizhni Tagilsk began in 1824, and in the following year the metal was found also in the Goroblagodat district.

Since that time the metal has been found in many other localities in the government of Perm, but those which have produced the bulk of the commercial metal are in the districts southwest of Nizhni Tagilsk and northwest of Nizhni Turinsk. The Goroblagodat and Bilimbaievsk districts, in the northeast of the latter place are at present the most active producers of the metal.

Outside of Russia and Colombia, platinum has been produced, though only in comparatively small quantities, in California, Oregon, Washington, British Columbia, Borneo, and New South Wales. Great efforts have been made in recent years to increase the output especially in British Columbia and in New South Wales, but apparently without success.

EXTRACTION AND PURIFICATION.

Since the platinum of commerce is exclusively derived from alluvial deposits, the methods employed for its recovery are essentially similar to those employed in gold placers; indeed, if we except the Uralian districts, it may be said that platinum is generally obtained as a by-product in gold washing.

The Russian platinum-bearing gravels, which are covered with barren material, from a few feet to 50 feet in depth, are worked partly by open mining, but usually by sinking shallow shafts and drifting along the pay streak. The latter, as a rule, is only a few feet in thickness, and the gravels are said to run from .05 to 1 ounce per cubic yard.

Many attempts to render platinum malleable and ductile were made during the latter part of the eighteenth century, and while a few men, like Achard, the Court of Sichengen, and the skillful metal workers Chabanneau and Jeannetty, of Paris, succeeded in doing it on a small scale, it was not until the early years of the nineteenth century that the platinum industry was really founded, and the creators of the industry were Englishmen.

About the year 1800, Charles Knight, devised a process which, while still imperfect, embodied the principal features of the method by which all commercial platinum was obtained for more than fifty years. It consisted in dissolving the crude metal in aqua-regia, precipitating the solution of the chloride with sal-ammoniac, then packing the dried precipitate into conical molds of fire clay, and strongly heating it in the mold. It is said that the metal was thus obtained as a coherent mass which could be hammered and worked into various forms.

The product, however, still lacked homogeneity and solidity, and it was only by important modifications that it became a commercial success. The improved process is usually credited to the chemist Wollaston, but according to Roscoe, the main features were

invented by a relative of a member of the firm of Johnson & Matthey. However that may be, it is still certain that the improved process was first described by Wollaston in the Bakerian Lecture for 1828 and Faraday, who was undoubtedly well informed on the subject, said in a lecture on platinum, delivered in 1861; "This substance has been given to us hitherto mainly through the philosophy of Dr. Wollaston."

In the process described by Wollaston the double chloride of platinum and ammonium was very carefully heated to a temperature just high enough to expel the ammonium salt, whereby the cohesion of the resulting particles of metal was prevented. The product was then rubbed by hand, sufficiently fine to pass through a lawn sieve. It was then made into a uniform pulp with water, and this was placed into a brass cylinder, where it was powerfully compressed by means of a lever. The hard cake which resulted was heated on a charcoal fire, to expel the water and promote cohesion, and finally heated at the highest temperature attainable in a wind furnace. By forging the white-hot cake under a heavy hammer, it was consolidated into an ingot, which could be beaten into thin sheets and drawn into the finest wire. The refractory natural product had been conquered, and henceforth platinum was one of the useful metals.

That platinum is not infusible was shown in 1758, when Baumé and Macquer succeeded in melting grains of the ore by the aid of a concave mirror; but the melting of considerable quantities of the metal was a feat which was first accomplished in our city: in 1847 Robert Hare demonstrated that the difficult and tedious process of consolidating platinum sponge could be replaced by the simple operation of fusing the metal in the oxyhydrogen flame. He melted as much as two pounds of platinum at a time.

His process was greatly improved by the French chemists Deville and Debray, and it was through them that it became more generally known, and that it was adopted by the platinum refiners.

Deville's furnace consists of two well-fitting pieces of quicklime, hollowed out to form a crucible or hearth. An opening at the side serves as a spout for the molten metal and for carrying off the fumes and products of combustion. The nozzle of the oxyhydrogen blowpipe is introduced through an opening in the centre of the cover.

Lime is used because it is infusible at the temperature of the flame, and because it is porous and absorbs the slags formed during the operation. It is also a poor conductor of heat.

I had the privilege of seeing this process in operation at the Heræus works at Hanau. Although they used illuminating gas instead of hydrogen, it was amazing to see the platinum sponge and scrap melt like butter as fast as it was fed in. You cannot, however, distinguish the metal from the lime, as both glow with the same intensity, and one must also protect the eyes with dark glasses when looking into the furnace. At the Heræus works I was shown all the principal operations, from

Russian Platinum Coins.

the treatment of the ore with aqua regia, to the production of the ingot. Incidentally I also learned how such by-products as iridium, palladium, rhodium, and osmic acid are obtained and handled.

Although several methods have been proposed for the refining of platinum, it appears that the treatment of the ore in the different works is essentially the same; for there is little difference in the manufactured product, whether it come from London, Paris, Hanau, St. Petersburg, or our American refineries.

At the Heræus works the ore is boiled under pressure with dilute aqua regia, whereby the platinum and some of the associated

metals pass in solution in the form of chlorides, while the iridosmium and gangue remain undissolved. The chloride solution is evaporated to dryness and heated at 125° C. The residue is then dissolved in water, acidified with hydrochloric acid and precipitated with sal ammoniac. The resulting double chloride, containing only small amounts of other metals, is finally reduced in the manner which I have already described.

The refining of platinum in the dry way, as proposed by Deville and Debray, does not seem to have proved successful, except in special cases and on a smaller scale.

The preparation of chemically pure platinum, *i. e.*, a product which is entirely free from iridium, rhodium, etc., is extremely difficult and tedious, and need not be discussed here.

PROPERTIES OF PLATINUM

The characteristic color and lustre of the metal, though long familiar to the chemist, have only in recent years caught the popular fancy, and their noble ornamental effects have just begun to be appreciated. The specific gravity of pure platinum is 21.48, but that of the manufactured metal varies considerably, according to the manner in which it has been obtained, and it is also affected by impurities in it. Pure platinum is quite soft, flexible and extremely malleable and ductile. Like wrought-iron, it can be welded at a white heat. Its coefficient of expansion is the same as that of certain kinds of glass. Its melting point is about 1700°C. (or about 3100°F.) and at a still higher temperature it volatilizes. Moissan has shown that it can be distilled in an electric furnace.

At a red heat it is remarkably pervious to hydrogen gas, which is due to the fact that it combines with or absorbs this gas at high temperatures. It forms fusible alloys with many of the metals. One of its most valuable properties is that it does not tarnish or combine with oxygen, even at high temperatures. In the molten state it it absorbs some oxygen, which however escapes when the metal solidifies.

USES OF PLATINUM.

Platinum has not inaptly been called "white gold." Its physical and chemical properties closely resemble those of the yellow metal with which it is generally associated in Nature. But in addition to the many virtues which it shares with gold, platinum has several most valuable properties of its own, and it is chiefly to these that it owes its many uses in science and in the arts.

On account of the great difficulties which had to be overcome in freeing platinum from the other metals with which it occurs in Nature, it was many years after the discovery of the metal before it found any practical applications. The first platinum crucible is said to have been made by Achard. It must have been a very crude affair. The German chemist's process of rendering platinum malleable was improved by the Paris goldsmith Jeannetty, who enjoyed a great reputation for the platinum goods he turned out. I suppose the prototypes of the meter and kilogram were made by his process.

At the beginning of the nineteenth century vessels made of platinum were still so scarce and costly that very few chemists could boast of possessing such apparatus. It was not until the London firm of Johnson & Matthey and the chemist Wollaston developed their method of rendering platinum workable that wire, foil, crucibles, and other articles made of the metal came into more general use. As early as 1809 Johnson & Matthey manufactured a platinum still for the concentration of sulphuric acid which weighed 424 ounces.

Enormous quantities of platinum are also consumed in the manufacture of electrical apparatus; but, impressive as are the quantities of platinum required for such purposes, they are equalled, if not surpassed by those which are absorbed in the manufacture of dental supplies. It is estimated that fully 50 per-cent of the platinum of commerce is consumed in the production of pins, sockets and other attachments for artificial teeth.

In 1828, when the Russian Government had accumulated enormous stores of platinum from the Uralian districts, it was decided to convert this surplus into coins, and accordingly three denominations—of 3, 6, and 12 rubles—were minted and put in circulation. This minting of platinum continued until 1845, when it was stopped and the coins were withdrawn from circulation. The reason for this was that, the Russian Government being unable to fix and maintain the price of the metal, large quantities of the coins passed into other countries. Many of them are still preserved in the collections of numismatists.

Those shown on the screen are in the collection of the United States Mint in this city; others can be seen in the loan collection in Memorial Hall.

The metal from which these coins were made was not pure platinum. According to Faraday, it contains platinum, 97.0; iridium, 1.2; rhodium, .5; palladium, .25; together with traces of copper and iron.

Just as gold and silver are alloyed with copper (and other metals) to increase their hardness and wearing qualities, so platinum is often alloyed with iridium to increase its resistance to abrasion and the attack of chemicals. Such an alloy goes under the name of "hard" platinum, as distinguished from ordinary platinum. It is more expensive than the latter. Thus most of the vessels used by chemists contain about 2 per cent. of iridium, while much larger proportions of the latter—from 10 to 15 per cent.—are added to the platinum used for the construction of standards of length and weight, for electrodes exposed to severe chemical attack, for sparking plugs, and the points of fountain pens.

For special purposes platinum is sometimes alloyed with other metals. An alloy with rhodium is used in certain electric pyrometers; and various alloys with copper, nickel, tungsten, and manganese serve as substitutes for steel in the construction of non-magnetic watches.

SUBSTITUTES FOR PLATINUM.

In view of the great increase in the price of platinum it is but natural that many and persistent attempts have been made to find substitutes for it. In a few instances this has been partially, or even wholly, accomplished; as yet however, the introduction of such substitutes has had no appreciable effect upon the price of the metal; indeed, it may be said that the demand for platinum has steadily increased in spite of them.

Among the substitutes may be mentioned platinum-clad nickel steel wire, which is beginning to displace the solid wire in incandescent electric lamps; wires of nickel alloys which are used in making the cheaper grades of artificial teeth; asbestos thread which has replaced platinum wire in the Welsbach mantles; and the fused-quartz ware, now so extensively employed in chemical laboratories in the place of platinum utensils.

CONCLUSION.

In the United States the production of platinum has been very irregular; it now amounts to several hundred ounces a year: in 1906 a high record was reached with 1,439 ounces, valued at $45,189. Statistics of the production of platinum in British Columbia, Borneo, and New South Wales show great fluctuations, but the totals are quite small, and have probably not reached 100 kilograms in any one year.

The distribution of platinum in the principal industries was estimated by Siebert (writing in 1902) to be as follows: 50 per cent. for dental manufacturers; 30 per cent. for chemical and electrochemical industries, and 20 per cent. for electrical manufacturers and jewelry. The use of platinum for jewelry has greatly increased since 1902.

Problems in Electroplating.

At a meeting of the Sheffield Society of Applied Metallurgy on November 4, Dr. R. S. Hutton, the newly elected President, said the practical application of science to the silver and electroplate industries was vital to their progress, and he emphasised the need of practical men gaining a good foundation of chemistry and physics. He also advocated a freer exchange of opinion and experience, and deprecated the policy of secretiveness and jealousy which was so prevalent in the trades referred to. In this respect the American manufacturers set an excellent example. The present high standard of quality and excellence of work in Sheffield he attributed to the men in the plating departments. By their conscientiousness and their honesty in carrying on their work they had brought Sheffield to a position which was absolutely at the head of the silver-plating trade of the world. It was very easy to cut the deposits, to produce second-grade work, and to slur over faults in the plating, but in Sheffield houses this was strenuously opposed. The speaker went on to refer to the importance of nickel-plating aluminum, which was already being done in Germany. Other matters needing investigation were annealing, removing "fire" from silver, and the recovery of waste material.—*The Ironmonger.*

New Books.

PRACTICAL SHEET AND PLATE METAL WORK, by Evan A. Atkins, A. M. I. M. E. Second Edition, Revised and Enlarged with 450 Illustrations. 524 Pages. The McMillan Co., New York City, and Whittaker & Co., London, E. C. England. Price $2.00 net The working and forming of sheet metals has become a subject of great importance at the present time and a large number of persons are employed in it. The automobile trade is an example of one of the new lines that has recently opened for such work as practically all the bodies used are made of sheet. This book contains complete information in regard to the making of all kinds of sheet metal articles by hand and directions are given for laying out the work in a scientific manner. The making of automobile fenders, trunks, kettles, pipes, phonograph horns and a large variety of special work is well described. The various tools and machinery necessary for working the sheet metal are described and illustrated with many engravings. The book is one that should be in the hands of those who are engaged in manufacturing sheet metal goods of any kind and will be found of the utmost service.

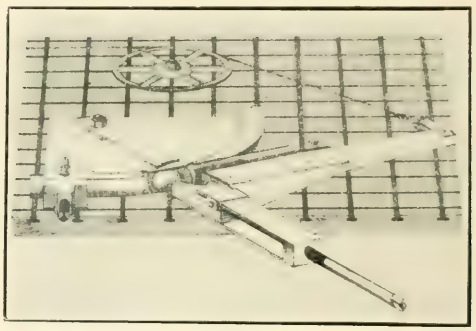
BRASSES, by J. S. M. Ward, B. A., F. R. Hist. S., New York, G. P. Putnam's Sons, and Cambridge, England, the University Press. 159 pages, 24 illustrations. Price, 40 cents. This book is a description of the monumental brasses in existence in Great Britain and in other countries. It is stated that in England there are more brasses used as monuments than in all aother countries combined. The book describes the brasses from the standpoint of art and does not treat of their metallurgical aspect.

THE "MECHANICAL WORLD" ELECTRICAL POCKET BOOK FOR 1913. Emmott & Co., Ltd. Manchester, England. A useful book of 240 pages and of pocket size. Contains 98 illustrations. Price 6 pence. A large amount of useful and valuable data is contained in the book in form of tables and articles. The information is principally of an electrical nature and will be of great value to those engaged in electrical work. The matter has the advantage of being up to date and will, therefore, be found particularly serviceable on account of the difficulty of obtaining it from the average text book on electricity. The average treatise of this kind does not contain the latest electrical information.

Bending Tubing.

In a paper on the "Manufacture and Use of Steel Tubing" by J. H. Nicholson* and Emil Holinger* in the *Journal of the American Society of Naval Engineers*, November 1912, the following remarks upon the bending of tubing were made:

The bending of tubes has always been considered a difficult undertaking, especially the production of a bend that would not more or less distort the round section of the tube. This difficulty is partly, if not wholly, overcome in



Method of Bending Tubing by Means of a Ball Plug.

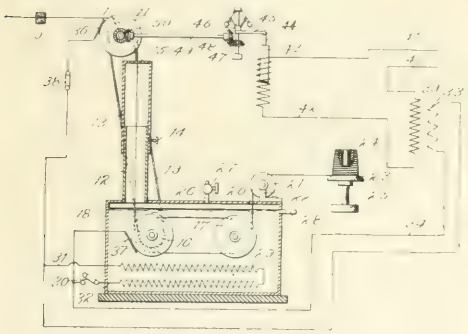
bending the tubes in a simple machine illustrated in this plate. The tube is held in a clamp fastened to a circular form around which the bend is to be made. An arm pivoted to the center of the radius of the bend is provided with a shoe, or half round section, to conform to the circular shape of the tube; this shoe is by means of a screw tightly held down on the tube; a round ball held by a chain having been inserted on the inside of the tube and held there, the chain being fastened to the lever by which the pivoted arm is pulled around the tube form. After the tube has been fastened as described, the arm by means of the lever and wire rope is pulled around the form, bending the tube with it. The ball inside

*With the National Tube Company of Pittsburgh, Pa.

of the tube, following the arm, is always held at the tangent point of the bend, thereby preventing the collapsing or distorting of the tube in the bending operation.

An Apparatus for Annealing Copper Wire by Electricity.

An apparatus for annealing wire by passing an electric current through it has been patented by William E. Gibbs of the Gibbs Company of Plainfield, N. J. The apparatus is herewith illustrated and is designed more particularly for use in drawing the finer sizes of copper wire.



Apparatus for Annealing Wire by Electricity.

The wire is annealed by passing either a direct or an alternating current through it. One of the features of the apparatus lies in the fact that the voltage regulation is maintained in proper relation to the speed at which it is drawn. One of the obstacles previously encountered in annealing wire by electricity has been the oxidation of the wire. The wire can be cooled after annealing by passing it through water and this means is employed in this apparatus, but ordinarily it does not prevent oxidation. In the present invention the water, into which the wire passes is heated by an auxiliary coil so that it produces steam. The steam issuing from the surface of the water, envelopes the hot wire and reduces any oxide that may form and also prevents its formation, as the case may be.

Magnesium is not permanent in the air but is soon covered with a white coating of magnesium oxide. This takes place rapidly in damp air. The metal, therefore, is unsuitable for ornamental purposes, although it could be protected by lacquer.

A Novel Type of Mold for Casting Babbitt-Metal and Other Soft Metals.

The casting of babbitt-metal, linotype-metal, monotype-metal and similar alloys is not a difficult operation, but rapidity and convenience are an important feature. A new type of reversible mold has been patented by Thomas C. Sheehan of the Automatic Furnace Co. of New York City. It is intended for use in casting bars or ingots of the aforesaid metals. The mold is water-jacketed and the construction may be understood from the following description:

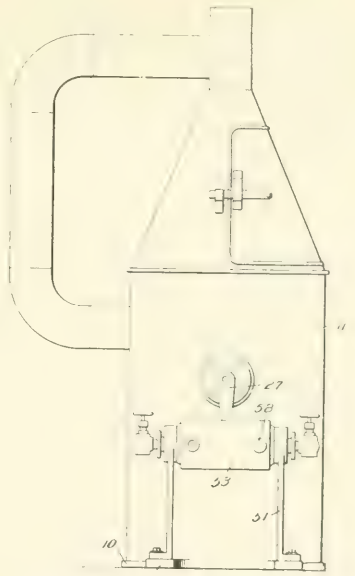


Fig. 1. Melting Kettle for Soft Metals and Water-Jacketed, Revolving Mold.

On a base 10 is mounted the crucible furnace 11 or the like with which the invention is to be used. It preferably has a crucible having a nozzle or pouring spout 27 of any desired kind.

In order to receive the discharged metal, projections 50 on the base 10 are so arranged as to carry a pair of brackets 51 which have bearings for supporting cylindrical hubs 52 on a reversible mold 53. These hubs are traversed by water pipes 54, one of which supplies cooling water from any convenient source and the other discharges it. In order to provide a tight joint for the water pipes a packing gland 55 is provided, as will be readily

understood. One of the packing glands has a flange with a pair of V-shaped notches 50 and on the corresponding bracket is located a spring 57 having a V-shaped projection to engage these notches.

The mold is provided with handles 58 for inverting it and with mold cavities 59 and 60 on opposite sides. These mold cavities may be of the same shape and character on two sides or otherwise. In the form illustrated, the cavities 59 are comparatively shallow and are designed to form slugs or pigs for use in monotype machines, while the cavities 60 are of larger size designed to form slugs or pigs for linotype machines.

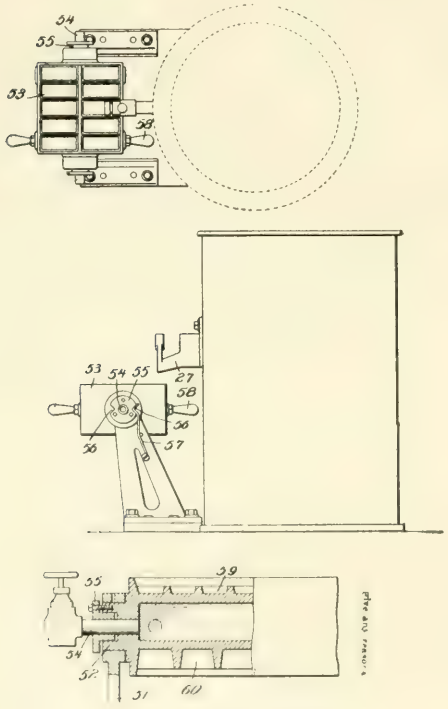


Fig. 2. Details of the Mold.

In case the mold is provided with mold cavities on more than two faces, a corresponding number of notches 56 will, of course, be employed. When one side of the mold is filled and the metal is sufficiently set, the handle 58 is grasped and turned, the shape of the notch and the spring 57 being such that while sufficient resistance is presented to prevent accidental inversion of the mold, it will permit it to be positively turned over without necessitating any setting of the parts. When the mold is completely reversed, the other notch is in position to receive the spring and the mold is held up ready to receive its next charge. The casting may be received on the floor or in a movable receptacle placed between the brackets 51.

A Process for the Recovery of Ammonium and Zinc Values from Sal-Ammoniac Skimmings.

In hot galvanizing by means of melted zinc, into which the iron or steel goods are dipped in order to coat them, it is necessary to now and then throw sal-ammoniac on the surface of the metal in order to cleanse it from dross. This results in the formation of a material called "sal-ammoniac skimmings". These skimmings are rock-like masses and consist of zinc oxide, zinc chloride, zinc oxychloride, metallic zinc and sal-ammoniac, together with small quantities of the chloride of iron, and the oxides of tin, iron and lead from the impurities in the zinc.

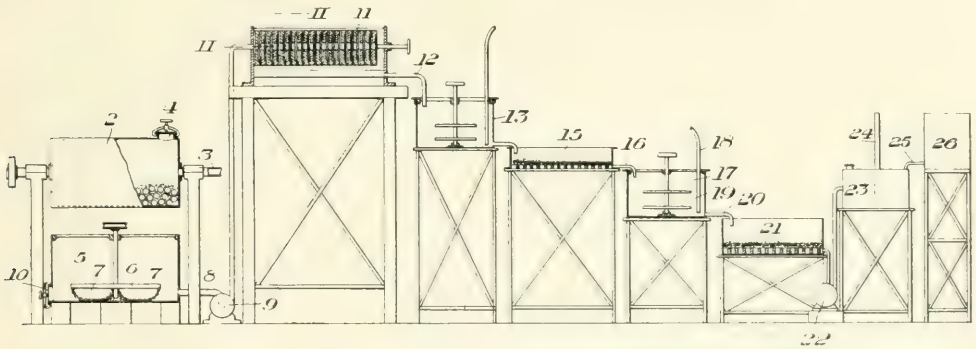
The treatment of these skimmings by leaching in the ordinary way to recover values from them is difficult. A new process for treating them has recently been patented by Joseph McFetridge of Vandergrift, Pa. of the American Sheet & Tin Plate Co. of the same place. His apparatus for carrying out the process is herewith illustrated and the process is as follows:

The sal-ammoniac skimmings are first broken to a convenient size for handling and are then digested with water in a suitable mill, preferably a ball-mill, as indicated at 2. The temperature is maintained at from 160 to 180 degrees F. by means of live steam. The water at once dissolves the soluble salts on the surface of the mass, and by rotating the mill, the friction of the grinding balls on the charge of sal-ammoniac skimmings removes the light film of oxide of zinc to thereby constantly expose fresh surfaces for the action of the hot water. In from one to two hours the charge is disintegrated, the soluble salts being in solution, the fine insoluble oxides and oxychlorides being held in suspension, and the metallic zinc free from zinc salts being in granular form. The charge is then removed from the digester 2 through a suitable opening 4, and is admitted into a wooden tank 5, which is provided with

rotary agitating arms 6 and a drag chain 7. The charge is kept in a state of gentle agitation in this tank by the rotating arms 6, the fine soluble oxide and oxychlorides of zinc being held in suspension, while the granules of metallic zinc drop to the bottom and are freed from adhering oxides by the drag chain 7. The soluble chlorides and suspended oxides and oxychlorides are drawn off through a pipe 8 to a centrifugal pump 9. The metallic zinc is removed from the tank 5 through the gate 10 and is returned to the galvanizing department, or is melted and cast into slabs of commercial zinc.

From the pump 9, the liquor is forced into the filter press 11, which may be of any suitable character, and the soluble zinc and ammonium chloride contained therein are separated from the insoluble zinc oxide and oxychloride. The mixture of oxide and oxychloride of zinc is mixed with caustic lime in quantities equivalent to the chlorine contained in the oxychloride and are furnaced at a dull red in a muffle furnace. The oxychloride of zinc is decomposed by lime and heat, forming chloride of calcium and oxide of zinc. The oxide of zinc formed by the decomposition of the oxychloride of zinc, together with the oxide of zinc originally present, are separated from the chloride of calcium by digesting with water in a suitable agitating tank, and then filtering, both being reclaimed as oxide of zinc, which may be used as pigment.

The zinc and ammonium chloride liquor separated from the oxide and oxychloride of zinc by the filtering press 11, flows through a pipe 12 into an oxidizing agitator 13. In this agitator the small percentage of ferrous chloride present is converted into ferric chloride by treating with a suitable oxidizing agent, preferably chlorine. When the iron has been converted to the higher chloride, it is precipitated in the agitator 13 by adding oxide of zinc, or by carbonate of zinc formed by adding carbonate of soda in such quantities that from one-half to one per cent. of zinc chloride is decomposed to form carbonate of zinc, which, like the oxide of zinc, has the property of precipitating iron in the form of peroxide from solutions of zinc chloride when the iron is in the form of ferric chloride. The precipitated iron is removed from the liquor by passing it through a suitable filter 15. The clear liquor from the filter 15 flows by gravity through a pipe 16 into a precipitating tank 17. The liquor is heated in this tank to near its boiling point by means of live steam admitted



Apparatus for Treating Sal-Ammoniac Skimmings Obtained in Galvanizing.

through pipe 18. The liquor is kept in a state of gentle agitation by suitable rotating stirring arms 19, and a hot carbonate of soda solution is added until all the zinc is precipitated as carbonate. The liquor with the suspended carbonate of zinc is drawn off through pipe 20 into a suitable filter 21, where the zinc carbonate is separated. This carbonate of zinc may be dried and sold as such, or it may be converted into zinc oxide by furnacing in a suitable muffle furnace to expel the carbonic soda.

The liquor from the filter 21 may be elevated by a centrifugal pump 22 into an iron still 23, and there treated with milk of lime to decompose the ammonium salts and liberate free ammonia. This free ammonia is expelled by live steam admitted through a pipe 24, and is carried through pipe 25 into an absorption tower 26, where it is absorbed in water, sulphuric acid or hydrochloric acid to form either a hydrate, sulphate or chloride of ammonium.

Questions and Answers.

QUESTION No. 1224. We melt a very great proportion of our ingot brass in a reverberatory furnace which has a capacity of about 30,000 lbs. A statement was made to us some time ago that it was possible to take ordinary composition mixture and reduce the zinc in it to about 1½ or 2 per-cent during the melting process. In short we would like to have you inform us whether it is possible or not, by any manner of means, to take ordinary composition and which will run, we will say, from 4 to 7 per-cent in zinc, and reduce it without actually burning it off. The copper, lead and tin contents must remain the same. What we want to make is a mixture containing 80% copper, 10% tin, and 10% lead, containing not over 1½ or 2 per-cent of lead. If you know of any method, let us know.

Answer. The only method for accomplishing what you desire is a patented process. It is done by means of oxide of lead. The composition or brass is melted and oxide of lead is used as a flux upon its surface. The zinc in the molten metal reduces the lead from its oxide and it enters the metal. The zinc becomes oxide of zinc and enters the slag. This process, we believe, is in use.

QUESTION No. 1226. What effect will oxide of magnesium have on brass or bronze? We notice that magnesium is extensively used for this purpose, and being dealers in oxide of magnesium, have had an idea that possibly this might have some action on the metal as well as metallic magnesium.

Answer. The action of oxide of magnesium on metals is simply like so much sand or dirt. It absolutely has no action. The metallic magnesium owes its value to the fact that it has an enormous affinity for oxygen. After it has taken up oxygen, it becomes oxide of magnesium. You will readily understand, therefore, why oxide of magnesium has no value in the way you mention.

QUESTION No. 1227. What is the best formula for removing borax from a joint after soldering? We use silver solder and borax for the soldering flux.

Answer. Use hot water as this is the best solvent for the fused borax. The hotter the water the better and if it is actually boiling it works faster.

QUESTION No. 1228. What will remove the scale from 18% German-silver that has been spun and then annealed?

Answer. Use the following pickle:

Water	8 parts or 1 gallon
Sulphuric Acid	1 part or 1 pint

If used hot, say at about 150 F., the pickle will work more rapidly than when cold. It can, however, be used at the regular temperature of the room, but then takes more time to dissolve the scale. This pickle, of course, will not leave the metal bright as no pickles do. It simply removes the oxide on the surface leaving the clean metal.

QUESTION No. 1229. What kind of furnace is generally used for re-melting aluminum scrap for rolling into sheet? Sheet scrap is to be used and this is to be cast in metal molds and then rolled into sheet again.

Answer. As far as we know, it is impossible to re-melt scrap and roll it. The aluminum cracks in rolling. Scrap is put into metal for sand castings and new metal is used for casting bars or slabs for rolling. The oxide, which forms to such an extent when scrap is melted, is the cause of the cracking as it intermingles with the metal and forms fissures, so to speak, which prevent the adhesion of the metal. The furnace for melting the aluminum for such work would be no different than any other used for melting aluminum.

QUESTION No. 1230. Do you consider a black nickel finish on brass as durable as other black finishes on the same metal? We wish to use the most durable black finish known for the brass and have had the impression that a black nickel finish would be the most permanent.

Answer. You will find the black nickel finish, if made from the regular formula, the best and most durable. The black nickel deposits made from formulas containing arsenic are not as durable. To obtain the best results, the black nickel deposit should always be lacquered.

QUESTION No. 1231. Have been using the following aluminum mixture for casting the spiders of automobile steering wheels:

Aluminum	24 lbs.
Copper	2½ lbs.
Zinc	2 lbs.
Tin	4 oz.

The castings, however, are too brittle and snap when any pressure is put upon them. We have used this mixture for making match plates with good results and do not understand why it cannot be used for the steering wheel spiders. What can be used in the mixture or how can it be changed for the work?

Answer. Your mixture may be good for match plates, but it is not good for steering wheel spiders. It is too brittle. Use the following which is a standard mixture for such work:

Aluminum	82 lbs.
Zinc	15 lbs.
Copper	3 lbs.

If the castings are brittle, then you have poured the metal too hot or allowed it to overheat in the fire.

QUESTION No. 1232. In making our two-piece emblem-buttons, where one piece is soldered to another, we use soft solder, then, according to our usual way, we copper plate the

article and finally give it a flash in a gold plating bath. We find that the copper dip does not cover the solder marks and, of course, when we gold plate the goods, the soft solder shows up black. Should not this soft solder be covered by the copper deposit? What can be done to make it cover?

Answer. Your difficulty is in the cleaning of your work preparatory to copperplating. The solder is apparently oxidized in the cleaning solution. The copper will not cover it. If you are careful in the cleaning not to corrode the solder you will have no trouble. If you use a hot copper solution (i. e. from 120-150 degrees F. you will find that the solder will be covered better than when the solution is used cold).

QUESTION No. 1233. We desire to add some tungsten to bronze to ascertain whether it will have a beneficial influence. We have not been able to obtain solid tungsten but can obtain what is known as "tungsten powder". We have been informed that this is pure tungsten in the form of powder but it cannot be melted. We have added this to our bronze but it does not seem to alloy with it. How can it be alloyed?

Answer. As tungsten has the highest melting point of any known metal and is supposed to fuse at 5430° F., you will readily appreciate how difficult it is to alloy the tungsten with the bronze. The tungsten will probably dissolve or alloy to a certain extent in molten copper after some time, but the alloy will then vary and the metal is quite uncertain. The best method is to make an alloy of copper and tungsten, say 95% copper and 5% tungsten, in an electric furnace. The two metals can be melted together. This alloy can then be employed for making your bronze. The high heat of the electric furnace will probably enable you to alloy the tungsten and copper together.

QUESTION No. 1234. Can a steel tank be used for holding a silver plating solution, without being lined with asphalt or pitch? We desire to use a steel tank and have been informed that it can be used without lining, but it would seem to us better to line it.

Answer. You will find it preferable to line the steel tank for your silver solution. It will then keep your solution cleaner and there is less danger of short-circuits on account of imperfect electrical connections.

QUESTION No. 1235. I have been under the impression that there was illustrated in THE BRASS WORLD some time ago a machine for pressing brass turnings into bricks. Can you advise us whether this is successful and is being used?

Answer. You refer to the "Ronay" process for briquetting. By this process, it is possible to compress brass turnings and other fine material into such a compact mass that the briquette thus formed is nearly as solid as casting. It becomes possible, therefore, to melt such briquettes with the minimum amount of loss. The machine is the invention of Arpad Ronay of Budapest, Hungary and is simply a very powerful hydraulic press. The metal, however, is compressed on all sides so that the maximum compression can be obtained. There are one or two machines in this country, we understand for compressing iron borings. The machine is quite expensive.

QUESTION No. 1236. What is the cheapest kind of verde-antique finish that can be used? We have some cheap, cast-iron goods upon which we must apply this finish, yet it must be very cheap as we cannot afford, at the price we obtain, to go to much expense.

Answer. The cheapest method for producing the verde-antique finish is by the pigment process. A green pigment, such as carbonate of copper or chrome-green (finely ground) is mixed with a lacquer and the mass then applied to the article by means of a brush. The best method is to stipple it on as it leaves an attractive surface. If carbonate of copper is used for the pigment a light green is obtained. Chrome-green produces a darker color while still darker colors may be produced by mixing a little lampblack with the mass. Lacquers of this kind ready for use, with the pigments ground in, may be obtained from lacquer manufacturers and it is preferable to purchase them in this manner.

QUESTION No. 1238. What is the advantage of salt-water gilding over the regular process in which the current is used? We understand that it is quite extensively used at the present time.

Answer. Salt-water gilding possesses the advantage that inexperienced platers can obtain uniform results in color upon the work from day to day. This is brought about by the fact that the current for plating, being generated within the apparatus itself, is always the same. If the temperature of the solution remains the same, as it will if a steam-jacketed kettle is used, the results are always very gratifying. As there is no anode used, there is no danger of enriching the solution beyond that desired, such as takes place in the ordinary method of gilding.

QUESTION No. 1239. Can the amount of gold deposited upon an article or articles be determined by scales in the same manner that silver is determined while the plating is going on? By this we refer to the use of scales to weigh the silver, such as on flat-ware, while the plating is taking place. We wish to determine the gold on goods in the same manner.

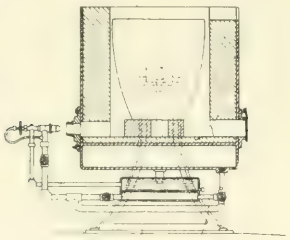
Answer. You cannot use this method in gold plating. The amount of gold deposited is so small that there are no scales you could use for estimating it while the electrodeposition is going on. While the work is in the solution, scales cease to be very sensitive on account of the buoyancy of the water. In silver plating, large scales are used so that any error that exists is reduced. Gilding is done upon such small quantities that the scales would not indicate anything. You will have to weigh the articles (a number or large quantity of them) before and after gilding; the difference giving you the amount of gold

Patent Abstracts.

1,044,295, Nov. 12, 1912. PROCESS OF PRODUCING SILICON CARBIDE. Frank J. Tone of Niagara Falls, N. Y. A process of manufacturing silicon carbide (carborundum) and which consists in using a core of solid carbon in the electric furnace instead of the usual core of pulverized carbon.

1,043,561, Nov. 5, 1912. TEST TUBE HEATER. James I. Ayer of Cambridge, Mass. Assignor to the Simplex Electric Heating Co. of the same place. A stand for holding test tubes and which is heated at the back by means of an electric resistance member. This allows the tube to be heated to varying degrees of temperature as may be desired.

1,044,012, Nov. 12, 1912. CRUCIBLE FURNACE. Wilhelm Buess of Hanover, Germany. A tilting crucible furnace using gas or oil for the fuel. The feature of the furnace lies in the fact that it can be tilted and

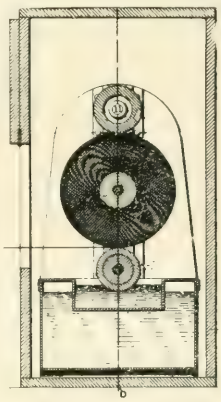


poured without cutting off the heating flame. The heating may be carried on while the pouring is taking place and the manner of placing the burner is such that this may be accomplished.

1,040,863, Oct. 8, 1912. OVERLOAD CONTROL FOR METAL ROLLS. George H. Blaxter of Beaver, Pa. A device for preventing damage to rolls or their connections when a bar of metal sticks between them, or when the metal is too hard for the regular "pinch". The connection between the fly wheel and rolls is broken automatically and it is accomplished by means of a magnetic disk.

1,041,525, Oct. 15, 1912. ELECTRIC DEPOSITION OF METALS. Arthur Percy Strohmenger of Westminister, London, England. The invention relates to electric welding and applies to the method of welding by fusing metal upon the joint. The operation is conducted by the use of an insulated electrode which is coated with a fusible insulated covering.

1,044,656, Nov. 19, 1912. PROCESS OF COATING TIN-FOIL AND THE RESULTING PRODUCT. Alexander J. Howell of Syracuse, N. Y. The invention relates to a process for coating tin-foil with paraffine. The tin foil is heated and the paraffine melted



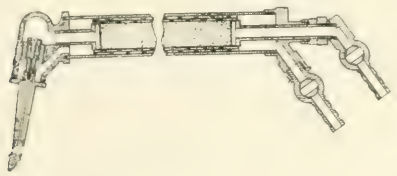
and the foil coated with it under pressure. The pressure is accomplished by rolls through which the foil is passed. The heating of the tin-foil is necessary for removing any moisture on it and to allow the paraffine to adhere.

1,043,937, Nov. 12, 1912. ANODE AND PROCESS OF MANUFACTURING SAME. Max Huth of Charlottenburg, Germany. Assignor to Siemens & Halske A. G. of Berlin, Germany. An anode of a permanent nature for use in electrolyzing such solutions as sulphate of zinc, nitrate of copper, etc. Peroxide of manganese is made into blocks and in them imbedded pieces of pure peroxide of lead. The peroxide of lead is used on account of its greater electrical conductivity and the conductivity of the anode is thus increased.

1,039,712 and 1,039,714, Oct. 1, 1912. ENGRAVING MACHINE. William S. Eaton of Sag Harbor, N. Y. An engraving machine of the pantograph type and which is so constructed as to have a large range of work, both as to the length of lines reproduced without readjusting the machine.

1,043,102, Nov. 5, 1912. CHAPLET FOR METAL CASTING. Heinrich Heesemann of Herscid-Friedrichsthal, Germany. A chaplet for use in making sand castings. It is made of sheet metal and of a peculiar shape which, it is stated, adapts it for many varieties of castings.

1,044,651, Nov. 19, 1912. BLOWPIPE. John Harris of Cleveland, Ohio. Assignor to the Metals Welding Co. of the same place. A blowpipe for use in welding metals by means of the oxy-acteylene flame. The feature lies in the construction of the blowpipe so that it



will not oxidize or melt at the tip and thus obstruct the flame. The tip may also be quickly changed to adapt it to various sizes of flames necessary in carrying on the welding.

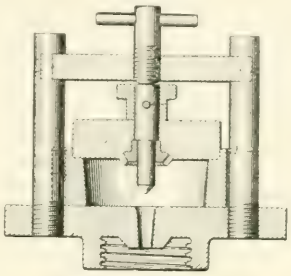
1,040,418, Oct. 8, 1912. METHOD OF JOINING METALS. Adolf F. Rietzel of Lynn, Mass. Assignor to the Thompson Electric Welding Co., of the same city. The invention is upon the method of joining two pieces of metal by electric welding. A third or coupling piece is used and pressure is applied when the welding is taking place.

1,043,977, Nov. 12, 1912. FOUNDRY FLASK. Irving R. Smith of Milwaukee, Wis. A metal flask made of sheet metal or strong or ribbed cross-section so that it will not become bent or distorted while in use. By the

use of a special rolled section of steel it is possible to make a light flask and yet stiff enough to stand the rough usage of the foundry without distortion.

1,041,297, Oct. 15, 1912. MATERIAL FOR TREATING COPPER. Julian Kich of Lyndora, Pa. A material for hardening copper. The copper is melted and the material added to it in the proportion of 1 part to 4½ parts of copper. It is then stirred in and the copper cast in the usual manner. It consists of "welding compound" 1 oz.; copperas (sulphate of iron), 1 oz; powdered bones, 1 oz.; ferro-silicon, 1 oz.; potash, 1 oz.; and limestone, 1 oz. The "welding compound" consists of 50% boracic acid, 15% oxide of iron, 15% soda, and 20% potash.

1,043,867, Nov. 12, 1912. CASTING OF METALS. A. L. J. Queneau of Philadelphia, Pa. Assignor to the Wetherill Finishing Castings Co. A method of making die-castings. The novelty lies in the manner of con-



structing the mold so that the casting not only can be easily removed after casting, but will be accurate in size. It is claimed that the mold made in this manner will give castings of great accuracy.

1,045,031, Nov. 19, 1912. APPARATUS FOR STRAIGHTENING METAL BARS. Isaac Lamont Hughes of Youngstown, Ohio. A machine for removing the irregularities of

metal bars by a series of rollers offset with one another. The arrangement of these rollers is shown in the sketch herewith illustrated.

1,040,569, Oct. 8, 1912. METHOD OF MAKING SEAMLESS TUBING. John W. Offutt of Ellwood City, Pa. Assignor to the Shelby Steel Tube Co., of Pittsburgh, Pa. The invention relates to the production of hot-finished tubes which require no further drawing. An improved method is used to prevent the pierced tubes are held and prevented from rotating about their longitudinal axis during the forming operations. The defects upon the interior of the tubes are also reduced and they are produced, it is stated, without scratches or grooves.

1,040,351, Oct. 8, 1912. MEASURING MACHINE FOR ROLLED METAL. George H. King of Anderson, Ind. Assignor to the King Measuring Device Company of the same place. A machine for measuring wire cloth and similar materials while being rolled or unrolled. The cloth passes through the appliance and comes in contact with rolls which manipulate indicating hands on a dial, thus recording the length of the cloth.

Trade Items.

The plant of the Tenacity Mfg. Co., of Cincinnati, Ohio, is being moved to Reading, Ohio and new equipment is to be added. Metal specialties are manufactured by them.

The Northern Brass Company of Waukegan, Ill., have begun an addition to their plant in that city. More extensive additions will be erected in the spring.

The Bastian Bros. Company of Rochester, N. Y., manufacturers of jewelry, have completed the three story addition to their plant in that city. This new addition is 45 x 110 feet.

The American Telephone Fire Alarm Co., Inc., has been incorporated in Rochester, N. Y., with a capital stock of $5,000,000 to manufacture fire alarm apparatus and devices. Among the incorporators are W. S. Harring and F. H. Smith.

The Brown Instrument Company of Philadelphia, Pa., manufacturers of pyrometers and recording instruments, are sending out to the trade a 1913 calendar with their compliments. This calendar will be sent to anyone making application for it and those who do not receive a copy should advise the company early in order to obtain one in good season.

E. C. Stearns & Company of Syracuse, N. Y., manufacturers of hardware specialties, have leased the Economy Foundry plant in that city and will install new equipment in it. This will enable the output of castings to be doubled. It will be operated to take care of the business of the Stearns Hardware Mfg. Company, controlled by the E. C. Stearns & Co.

Those who use sheet metal or wire goods made by stamping, drawing, press-work or automatic machinery, should obtain quotations from the Pritchard Stamping Company, 999 East Main St., Rochester, N. Y. They desire to figure on metal stamping and similar metal goods made of brass, steel tin, aluminum, copper or other metals and are prepared to turn out the goods in all commercial finishes. They are specialists in this line and have had many years of experience. Send them samples and specifications for quotations which will gladly be given.

The regular monthly meeting of the National Electroplaters' Association was held in New York City on Nov. 22nd. Two active and one associate member were elected. Various subjects were discussed, among which were: Dull black nickeling, black nickel as a ground for silver oxidizing, the gilding of small screws on optical goods, and the application of pigment lacquers. Several members addressed the meeting. The Convention and Banquet committees report progress and all are looking forward to marked success of both events. The next meeting will be held on Dec. 27th.

The Norwich Nickel & Brass Company of Norwich, Conn., manufacturers of window display fixtures, are to erect a new foundry 40 x 100 feet, one story high.

A new plant for the manufacture of brass, bronze and aluminum castings is to be erected by the Chadwick Brass Company, Ltd., at Hamilton, Ont.

A new nickel smelter is being erected by the Mond Nickel Company at Victoria Mines, Ont. Nickel matte is smelted in this place from the nickel ore found there.

The new plant of the Automatic Sprinkler Company of America, at Youngstown, Ohio is practically completed and will be occupied before the first of the year. The main building, which is composed of brick, steel and concrete is 240 x 400 feet.

Manufacturers and foundries who use aluminum should first obtain prices from the Foreign & Domestic Metals Co., H. L. Schwarzenberg, manager, 576 Rockefeller Bldg., Cleveland, Ohio. They are prepared to make very attractive prices on 98-99 per-cent aluminum in ingot form. They will be able to take care of all contracts. They also ask the opportunity to quote on Straits tin, ingot copper, lead, antimony and spelter.

The Spirella Company Ltd., has been incorporated in Niagara Falls, N. Y. with a capital stock of $1,400,000 to take over the Spirella Company which recently moved to that city from Meadville, Pa. A large addition to the plant will be erected. The manufacture of corset hardware and corsets is carried on. The directors of the company are G. W. Knox of Niagara Falls, N. Y. and W. S. Smith and I. B. Saunders of Meadville, Pa.

The E. Stebbins Mfg. Co., of Springfield, Mass., manufacturers of plumbers' brass goods, and which recently went into the hand of a receiver, is to be reorganized. It is stated that all creditors will be paid in full and the capital stock of the company increased from $50,000 to $100,000. The new securities will be in the form of preferred stock. A board of five directors will be elected, instead of three as heretofore, and will consist of Frederick Harris, L. J. Powers, F. L. Chapin, Joseph Shattuck, Jr., and Charles H. Downs.

The New Jersey Court of Appeals, in a decision recently handed down at Trenton, affirmed the decision of the lower court in regard to the suit of the Vulcan Detinning Co. against the American Can Co. The suit was brought against the American Can Co. for infringement on a detinning process used by the Vulcan Company. The infringement occurred in 1903-1907 and the suit has been in the courts for some time. The court awarded damages of $827,352. It is reported that the American Can Co. has carried a reserve fund for years to meet this contingency should it occur.

The Chase Rolling Mill of Waterbury, Conn., manufacturers of brass sheet, rod and wire, are to install additional electrical equipment at their Waterville plant. This will include generators operated by turbines.

The property of the Iowa Stove & Range Co. of Waterloo, Iowa has been purchased by the Howard Stove Works of Omaha, Neb. The Iowa Stove & Range Co. recently went into bankruptcy.

The Blasier-Sanborn Manufacturing Company has been incorporated in Utica, N. Y. with a capital stock of $350,000 to take over the plant and business of the M. E. Blasier Mfg. Co. of the same city. The manufacture of brass goods and hardware specialties is carried on. Automobile windshields are manufactured.

The Harley Company has succeeded the Millet & Harley Company of Springfield, Mass., manufacturers of brass and aluminum castings. The Millet & Harley Company succeeded the Millett Brass Co., some time ago. The manufacture of brass and aluminum castings is carried on and the company has one of the largest and best equipped brass foundries in the United States.

Joseph Reinbold, formerly with the Joseph Reinbold Bronze Co., of Newark, N. J., has started in business again at 475 Washington St., Newark, N. J. A new plant has been equipped and the manufacture of fine bronze, brass, gold and silver castings will be carried on. W. M. Prescott is a partner in the new firm. The name of the new concern is Reinbold & Co.

The Reliable Refinishing Co., 511-513 West 42nd St., New York City, make a specialty of refinishing all kinds of brass and metal goods so that they will be equal and frequently superior to the new article. All goods are finished with the "Damard" lacquers and which were originated in England. Brass bedsteads are a specialty of this company and the "Damard" lacquer is always used on them. Durability is thus insured. This company has a modern and exceptionally well equipped plant for carrying on refinishing.

The new Canadian plant of the H. Mueller Manufacturing Co. at Sarnia, Ont. Canada, has been put in operation and has been incorporated under the name of the H. Mueller Mfg. Co. Ltd. The officers are: President and general-manager, O. B. Mueller; vice-president and superintendent, C. G. Heiby; treasurer, Adolph Mueller; secretary, F. L. Riggin. The company is at present operating in a temporary factory but plans have been drawn for a large factory. The new plant will be located in the same place and which is about sixty miles across the river from Detroit. The main factory is at Decatur, Ill. It is stated that other lines of goods will be manufactured when the new plant has been completed. The company is one of the oldest and largest manufacturers of high grade plumbers' brass goods.

A new factory to be built by the Silversmiths Company, Ltd., at New Hamburg, Ont., will cost $70,000.

The Bridgeport Brass Co., of Bridgeport, Conn., manufacturers of sheet, wire, rod and tubing of copper and brass, have started work on their new tube mill. This will be 50 x 360 feet.

The Swenson Valve Co., of Decorah, Iowa, manufacturers of globe and angle valves, are working on a large order for use in connection with the hydroelectric development at Keokuk, Iowa, These are for the lubricating system and the order is said to be one of the largest ever placed for such a use.

The American Hardware Corporation of New Britain, Conn., manufacturers of hardware, and operating the plants of P. & F. Corbin and the Russell & Erwin Mfg. Co. together with other factories, has purchased the plant and business of the Universal Machine Screw Company of Hartford, Conn., and will operate it.

Joseph G. Kessler, 269-271 Russell St., Brooklyn, N. Y., is now producing a superior quality of spelter for use in galvanizing and in brass making. The spelter has his well known trade mark on each slab and large or small lots can be supplied immediately. Those who use spelter for galvanizing or brass making should obtain his prices.

The extensive use of fuel-oil at the present time necessitates that all manufacturers arrange for their 1913 supply. The Waverly Oil Works Co. of Pittsburgh, Pa., are now producing a high grade fuel oil for use in brass rolling mills, brass foundries and all other establishments where melting, annealing, hardening, etc., are done by means of oil. They solicit the opportunity to quote and are prepared to make very prompt shipments.

The Precision Die Casting Company, 422 South West St., Syracuse, N. Y., manufacturers of die castings, have moved into their new offices and factory. This factory was formerly that of the E. C. Stearns Co., makers of the Stearns bicycle. The Stearns Company still continue to occupy a portion of the building in the manufacture of hardware. The Precision Die Casting Company report a greatly increased business during the past year.

The Argus Smelting Company of Brooklyn, N. Y., have recently brought out something new in the ingot metal line which will be sure to meet with the approval of the brass founding trade. It is their "Argus" Valve Ingot Metal which is made by them on quality alone and has been found excellent for making the highest grade valves. They state that it is possible to produce better castings with it than the ordinary mixture used for this purpose and the valves will test better. The Argus Smelting Company, 60 Greenpoint Ave., Brooklyn, N. Y., have one of the largest plants in the country devoted to the production of ingot metals.

The Standard Chain Co. of York, Pa., chain manufacturers, are to erect a new steel frame building, 93 x 170 feet. It is expected that it will be ready by the middle of February.

The Grand Rapid Pearl Button Co. of Grand Rapids, Mich., have increased their capital stock from $100,000 to $200,000 and will build a new factory.

The Everitt Motor Car Co., of Detroit, Mich. has acquired a plot of land in Windsor, Ont., directly across from Detroit and 10 acres in extent. A new plant will be built on this land for the manufacture of automobiles. The business will be operated under the name of the Tudhope Motor Company.

The Vulcan Detinning Co. of Sewaren, N. J., which operates a plant for the recovering of tin from tin plate scrap, had a portion of their plant destroyed by fire on Nov. 8th. The damage will be repaired at once. An extensive plant, comprising buildings nearly six acres in extent is possessed by this company.

The new building being erected by Whipple & Choate of Bridgeport, Conn., manufacturers of brass and composition ingot metals, will contain thirty furnaces for melting. Crucibles will be used exclusively and a capacity of about 30,000 lbs. per day will be had in this new plant. The combined output of the new and the old plant will then approximate 75,000 lbs. of ingot metals per day.

In regard to the recent damage by fire to the plant of the Art Brass & Plating Company of Louisville, Ky., Charles Rindt, vice-president of the company reports that no additional equipment will be required as the damage can be repaired without new purchases. The plant is located at 448 South Fifth St., and the damage amounted to several thousand dollars.

A meeting of tne creditors of the Humphryes Mfg. Co., of Mansfield, Ohio, manufacturers of plumbers' brass and iron goods, was held on Nov. 7th. The Receiver reported an increase in the sale of the goods and the business is such that, if the plant should be closed, it would mean a large financial loss. Another meeting will be held in December to determine what shall be done. It is vitally important that the company shall be sold as a going concern.

W. D. Berry, general manager of the New Brighton (Pa.) Works of the Keystone Bronze Co., has recently been appointed superintendent of both the Pittsburgh and New Brighton plants. Mr. Berry has just completed some extensive improvements at the New Brighton works and about 2500 sq. feet of floor space has been added. Double the number of employees will now be used and the product has increased to about 60000 lbs. per month. In the near future some improvements will be made at the Pittsburgh works and when completed it is expected that the Keystone Bronze will be able to turn out 120,000 lbs. of copper bronze and brass castings per month.

Extensive additions to the works of the Olive Stove Works of Rochester, Pa., are contemplated and it is expected that they will be ready by the first of the year.

The Frink Pyrometer of Lancaster, Ohio have moved to Main and Front Sts., in that place where larger and more commodious quarters have been obtained.

Keppler & Weidelich, manufacturer of jewelry novelties, have moved from 38 Friendship St. to 56 Pine St. Providence, R. I. Fancy metal novelties are also manufactured in addition to jewelry.

The Pontiac Motor Castings Company has been organized in Pontiac, Mich., with a capital stock of $8,000 to manufacture brass and steel castings. Some of the incorporators are W. J. Brown, P. J. Donnelly and Timothy E. Lyons.

A new plant will be erected by the Northwest Brass Foundry Company, Ltd., at Calgary, Alta. Canada and which will be one of the largest industries in that city. The plant is to cost $300,000 and it is expected that 500 hands will be employed.

The John J. Jackson Co., 91 Mechanic St., Newark, N. J., manufacturers of rolled gold and silver, silver anodes and other precious metal specialties, are to build a new, two story, concrete factory in that city. The cost is to be $15,000 and it will be double of the size of the present plant.

The old firm of Alfred Vester & Sons of Providence, R. I., manufacturers of metal ornaments and jewelers' findings, have incorporated under the name of Alfred Vester & Sons, Inc. The capital stock is $50,000 and the officers are President, Gustave J. Vester; secretary and treasurer, Alfred J. Vester.

Bishop Bros., 151 Pine St., Providence, R. I., ond the Howard Baker Co., 85 Page St., Providence, R. I., have consolidated and the new company will be called the Bishop Bros. & Baker Co. The new location is at 85 Page St. Both concerns manufactured plated jewelry and the same lines will be continued.

A new concern, called the Lafayette Silver Co. has started in business at 93 Lafayette St., Newark, N. J. The manufacture of sterling-silver and German-silver toilet ware and novelties will be carried on. It is expected that the factory will be in operation about the first of the year.

The Bennett-Merwin Silver Co., has been incorporated in New Milford, Conn., and is now equipping a factory for manufacturing a line of both sterling silver and silver plated hollow-ware and novelties. Charles A. Bennett formerly of Taunton, Mass. is the president of the company. For many years he was head designer for the Reed & Barton Company of Taunton, Mass., the well known silversmiths, and is a man of extensive experience in the manufacture of silver goods New Milford capital is interested in the enterprise.

A new foundry is to be erected by the American Rotary Valve Co. of Anderson, Ind. It will be 40 x 90 feet and the construction will commence at once.

The Morse-Beauregard Manufacturing Company of Detroit, Mich., manufacturers of motorcycles, have increased their capital stock from $10,000 to $100,000.

The Michigan Mirror & Art Glass Co. has been incorporated in Jackson, Mich., with a capital stock of $10,000 to manufacture mirrors. The head of the company is Frank H. Haynes.

The Victor Brass Mfg. Co., has been incorporated in Cleveland, Ohio by W. H. Mahon and others with a capital stock of $20,000. A brass foundry business is to be carried on.

The new plant of the Stamford German Silver Company, recently organized at Stamford, Conn., to manufacture sheet, wire and rod German-silver, has been commenced. It is located in Springdale, a suburb of Stamford.

The Birmingham Brass Co., Ltd., has been incorporated in Toronto, Canada with a capital stock of $40,000 to manufacture brass and iron goods. A brass foundry will be equipped. Frederick Lee, M. D. Culbert and William Cartright are the incorporators.

The Crane Valve Co., of Bridgeport, Conn., manufacturers of steam-metal valves and iron goods, are to erect a new building for use as an emergency hospital. It will also contain an employment office and will be known as the employment department.

The Dow Wire & Iron Works of Louisville, Ky., manufacturers of ornamental iron and bronze work, are adding a building to their foundry which will be 45 x 100 feet. It is to cost about $3,000. New bending machinery is to be installed.

The Chicago Bearing Metal Co., 332 South Michigan Ave., Chicago, Ill., have acquired a piece of land on 43rd. St., in that city and will erect a new plant on it at a cost of $200,000. It will be of fire-proof construction and will be used for the manufacture of bronze and brass products.

E. G. Meeker, 40-42-44 Green St., Newark, N. J. manufactures of brushes exclusively for the plating and polishing trades. His assortment is exceptionally large and every conceivable kind of wire, bristle or tampico brush can be supplied. All standard brushes are carried in stock for immediate shipment. Let him figure on your needs. All orders will receive prompt and careful attention.

Rockhill & Vietor, 114 John St., New York City and 17 North Franklin St., Chicago, Ill., manufacturers of the "Nonesuch" electroplating machines (Patented July 28th. 1908 and June 18th. 1912) which are now so extensively used for electroplating small metal goods in bulk, reports a very flattering demand for their goods at the present time. The sale is rapidly increasing.

The Model Stove & Mfg. Co. of Carthage, Mo., and the Queen Bee Stove Co. of Tulsa, Oklahoma, have consolidated.

The National Stove Company of Lorain, Ohio, are to enlarge their plant by the erection of an enameling department. This addition will be 60 x 100 feet.

A tumbling barrel, used for rolling steel buttons, exploded at the works of the Platt Bros. & Company of Waterbury, Conn., on Nov. 22nd, but caused no loss of life. The building was considerably damaged. The pressure of the gas, generated during the rolling, caused the explosion.

The business and plant of the James E. Blake Co. of Attleboro, Mass., manufacturer of sterling-silver and German-silver novelties, has been purchased by Horace Remington & Sons of Providence, R. I., the well known gold and silver refiners. All the real estate owned by the James E. Blake Company has been purchased.

Personal.

William B. Dickson, formerly first vice-president of the United States Steel Corporation, has been elected president of the International Steam Pump Company. He succeeds the late Benjamin Guggenheim.

William Mintie of Waterbury, Conn., has become associated with the F. L. & J. C. Codman Company of Boston, Mass., manufacturers of buffs. Mr. Mintie will have charge of the New York City territory.

R. H. Sliter, president of the National Electroplaters' Association, who recently severed his connection with the E. Schroeder Lamp Works of Jersey City, N. J., with whom he had been connected as foreman plater for some time, is now associated with the Celluloid Zapon Co., of New York City and will travel for them in the Middle West.

Obituary.

Frank B. Reaves, formerly superintendent of the South Bend Watch Co. of South Bend, Ind., died on Nov. 13th, in the Indiana Hospital for the Insane. Several months ago he visited Europe and became lost, but his relatives found him ill in Germany and brought him back to this country. Mr. Reaves was a man of marked ability in his line.

Theophilus Zurbrugg, formerly president of the Keystone Watch Case Co., of Philadelphia, Pa., died at his home in Delano, N. J., aged fifty-eight years. He came to this country when a boy from Switzerland and when twenty-five years of age began the manufacture of cheap watches. Later he bough the Keystone Watch Case Co., the Howard Watch Works, the New York Standard Watch Co., and Bates & Bacon, all of which were consolidated under the name of the Keystone Watch Case Company.

Current Metal and Supply Prices.

These Prices are net and are for moderate quantities. Smaller quantities command higher prices. Prices subject to fluctuation.

Acetone, pure, 98-99%	lb.	.22
Acid, Acetic, pure, 30%	lb.	.07
Acid, Arsenious (White Arsenic)	lb.	.20
Acid, Benzoic	lb.	.55
Acid, Boracic (Boric), pure	lb.	.12
Acid, Hydrochloric, see Acid, Muriatic.		
Acid, Hydrofluoric, 30%	lb.	.04
Acid, Hydrofluoric, 50%	lb.	.10
Acid, Muriatic, 20°	lb.	.02
Acid, Muriatic, c. p., 20°	lb.	.07
Acid, Nitric, 38°	lb.	.05⅝
Acid, Nitric, 40°	lb.	.05⅞
Acid, Nitric, 42°	lb.	.06¼
Acid, Nitric, c. p.,	lb.	.08
Acid, Sulphuric, 66°	lb.	.01¾
Acid, Sulphuric, c. p.	lb.	.06
Alcohol, Wood	gal.	.50
Alcohol, Denatured	gal.	.55
Alum	lb.	.04
Aluminum, Metallic, in Ingots	lb.	.26¾
Ammonium Sulphate	lb.	.07
Aqua-Fortis, see Acid, Nitric.		
Ammonia Water (Aqua-Ammonia, 20°	lb.	.04¾
Ammonia Water (Aqua-Ammonia), 26°	lb.	.06¼
Ammonia Water, c. p.	lb.	.08
Ammonium Carbonate, lump	lb.	.15
Ammonium Chloride (Sal-Ammoniac)	lb.	.12
Ammonium Hydrosulphuret	lb.	.30
Ammonium Sulphate	lb.	.07
Ammonium Suphocyanate	lb.	.50
Amyl Acetate	gal.	3.50
Antimony	lb.	.10¼
Arsenic, Metallic	lb.	.10
Arsenic, White (Acid Arsenious)	lb.	.20
Argols, White (Cream of Tartar)	lb.	.31
Asphaltum, Commercial	lb.	.05
Asphaltum, Egyptian (Bitumen)	lb.	.30
Benzine	gal.	.15
Benzol, Pure	gal.	.50
Bismuth, Metallic	lb.	2.00
Bitumen, see Asphaltum.		
Blue-Vitrol, see Copper Sulphate.		
Borax, Crystals or Powdered	lb.	.10
Borax Glass	lb.	.35
Cadmium, Metallic	lb.	.85
Carbon Bisulphide	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.10
Chrome-Green	lb.	.50
Copper, Lake, (carload)	lb.	.17¾
Copper, Lake, (cask)	lb.	.18
Copper, Electrolytic, (cask)	lb.	.17¾
Copper, Electrolytic, (carload)	lb.	.17½
Copper, Casting, (carload)	lb.	.17⅜
Copper, Casting, (cask)	lb.	.17⅝
Copper Acetate (Verdigris)	lb.	.35
Copper Carbonate, dry	lb.	.25
Copper Sulphate (Blue-Stone)	lb.	.09
Corrosive Sublimate, see Mercury Bichloride.		
Cream-Tartar, see Potassium Bitartarate.		
Cryolite	lb.	.12
Cyanide, see Potassium Cyanide.		
Dextrin	lb.	.15
Emery Flour	lb.	.04
Emery, F F & F F F	lb.	.03
Flint, powdered	lb.	.01
Flour Spar	lb.	.01¼
Fuel Oil	gal.	3.50
Gold Chloride	oz.	11.75
Gold, Pure	oz.	20.87
Gum Copal	lb.	.30
Gum Camphor	lb.	.26
Gum Mastic	lb.	.70
Gum Sandarac	lb.	.35
Gum Shellac, brown	lb.	.50
Gum Shellac, white	lb.	.60
Iridium	oz.	63.50
Iron Perchloride	lb.	.25
Iron Sulphate (Copperas)	lb.	.05
Lead Acetate (Sugar of Lead)	lb.	.15
Lead, Pig	lb.	.04⅜
Lead, Red	lb.	.12
Lead, Yellow Oxide (Litharge)	lb.	.12
Liver of Sulphur, see Potassium Sulphide.		
Manganese, Ferro, 80%	lb.	.10
Manganese, Metallic, pure	lb.	.75
Magnesium, Metallic	lb.	1.50
Mercury Bichloride (Corrosive Sublimate)	lb.	1.16
Mercury, Metallic (Quicksilver)	lb.	.41
Mercury Nitrate	lb.	1.50
Mercury Oxide, yellow	lb.	1.80
Nickel and Ammonium Sulphate (Double Salts)	lb.	.08
Nickel Carbonate, dry	lb.	.60
Nickel Chloride	lb.	.50
Nickel Metallic	lb.	.45
Nickel Sulphate (Single Salts)	lb.	.12
Nitre (Satpetre), see Potassium Nitrate.		
Oil of Vitriol, see Acid, Sulphuric.		
Paraffine	lb.	.15
Phosphorus, yellow	lb.	.40
Phosphorus, red	lb.	1.10
Pitch	lb.	.05
Plaster of Paris, Dental	bbl.	4.00
Platinum Cloride	oz.	23.00
Platinum Metallic	oz.	48.00
Potash-by-Alcohol, in sticks	lb.	.50
Potash, Caustic	lb.	.05½
Potassium Bichromate	lb.	.14
Potassium Bitartarate (Cream of Tartar)	lb.	.31
Potassium Carbonate (Pearlash)	lb.	.10
Potassium Chlorate	lb.	.15
Potassium Cyanide	lb.	.25
Potassium Iodide	lb.	2.25
Potassium Nitrate (Nitre or Saltpetre)	lb.	.10
Potassium Permanganate	lb.	.17
Potassium, Red Prussiate	lb.	.60
Potassium, Yellow Prussiate	lb.	.24
Potassium Sulphide (Liver of Sulphur)	lb.	.15
Potassium Sulphuret, see Potassium Sulphide.		
Potassium Sulphocyanate	lb.	.70
Pumice, Ground	lb.	.05
Quartz, Powdered	lb.	.01
Rosin, Yellow	lb.	.08
Sal-Ammoniac, see Ammonium Chloride.		
Sal-Soda, see Sodium Carbonate.		
Silver Chloride, dry	oz.	.75
Silver Cyanide	oz.	1.00
Silver, Fine	oz.	.63⅝
Silver Nitrate, crystals	oz.	.50
Soda-Ash	lb.	.05
Sodium Biborate, see Borax.		
Sodium Bisulphite	lb.	.15
Sodium Carbonate (Sal-Soda), crystals	lb.	.02
Sodium Hydrate (Caustic Soda)	lb.	.05
Sodium Hydrate (Caustic Soda) by Alcohol (in sticks)	lb.	.45
Sodium Hyposulphite ("Hypo")	lb.	.04
Sodium Metallic	lb.	.90
Sodium Nitrate	lb.	.05
Sodium Phosphate	lb.	.09
Sodium Silicate (Water-Glass)	lb.	.04
Soot, Calcined	lb.	.15
Spelter, see Zinc.		
Sugar of Lead, see Lead Acetate.		
Sulphur (Brimstone), in lump	lb.	.05
Tin Chloride	lb.	.43
Tin, Metallic	lb.	.19¾
Turpentine, Venice	lb.	.35
Verdigris, see Copper Acetate.		
Water, Distilled	gal.	.15
Water-Glass, see Sodium Silicate.		
Wax, Beeswax, yellow	lb.	.45
Wax, Carnauba	lb.	.70
Whiting (Ground Chalk)	lb.	.02
Zinc, Carbonate, dry	lb.	.19
Zinc, Chloride	lb.	.12
Zinc, Sulphate	lb.	.06
Zinc, (spelter)	lb.	.07⅜

INDEX

THE BRASS WORLD AND PLATERS' GUIDE

VOL. VIII

1912

JANUARY TO DECEMBER

(INCLUSIVE)

INDEX

—A—

Abrasive Wheels for Grinding Brass 236
Acetone and its Properties 165
Acetylene on Brass, Effect of 81
Acid Metal, Mixture for 205
Alloy Containing Silicon, Brass 390
Alloy, New, Cheap White-Metal 435
Alloy, Supermagnetic 166
Alloys, Errors in Use of Manganese in 191
Alloys, Making Titanium 143
Alloys, New Cheap White-Metal 204
Alloys, Pyrophoric 325
Alloys, Standard Methods of Sampling 136
Alloys, Vanadium Alloys and Their Application ... 274
Alumintin, Sheet 176
Aluminum, Advantage of Low Pouring "Heat" in Casting 428
Aluminum Alloy, New 119
Aluminum to Brass, Method of Adding 115
Aluminum Bronze, Use of Large Gate in Casting... 319
Aluminum, Centrifugal Machine for Purifying..... 105
Aluminum, Compound for Use in Machining 395
Aluminum, Effect of Beer on 409
Aluminum, Flux for Use in Soldering 292
Aluminum, French Method of Nickel Plating 291
Aluminum, German Method of Nickel Plating 58
Aluminum, Grinding 236
Aluminum, Kink in Grinding 247
Aluminum, New Flux for Welding 50
Aluminum, New Process for Coloring 164
Aluminum, New Process for Soldering 252
Aluminum in Place of Tin-Foil, Use of 396
Aluminum and Platinum, Alloys of 319
Aluminum, Process for Welding 324
Aluminum Solder 319
Aluminum, Standard Methods of Sampling 136
Aluminum in Tin Bronze, Use of 205
Aluminum, Use of Soap Bark in Tumbling 271
Aluminum, Use of Titanium in Purifying 126
Aluminum and Zinc Alloys, Rolling 290
Amalgamating Battery Zincs 196
Ammonia on Brass, Effect of 81
Ammonia in Silver Plating Solutions 284
Ammoniacal Baths, Coloring Metals in 318
Amyl Acetate and How it is Made 350
Analysis, Limits of Accuracy in Copper and Brass.. 141
Annealing of Coinage 404
Annealing Furnace, The "Rockwell" 365
Annealing with Gas in England 9
Annealing without Oxidation, Furnace for 209
Annealing Wire by Electricity 445
Anode Connection, Improved 131
Anode, "Leffel's" Form of 367
Anode, Most Economical Grade of Nickel 433
Anode, New or "Economy" Form of 215
Anodes, Alloyed 47
Anodes in Brass Solution, Use of Copper 80
Anodes in Electrogalvanizing, Cleaning 196
Anodes, Cause of Black Slime on Silver 87
Anodes, Purity in Silver 87
Anodes, Rolled and Cast 129
Anodes, Use of Brass 129
Anti Friction Metal, New 208
Antimonial Lead Castings, Making 117
Antimonial-Lead, Composite 243
Antimonial-Lead, Electroplating 344
Antimonial-Lead, Molds for 167
Antimony-Bronze Mixture 205
Arsenic in Brass Solutions, Use of 275
Art Metal Goods, Silver Finish for 394
Atomizing Soft Metals, Apparatus for 407
Automobile Engineers, Specifications for Sheet and Rod Brass of Society of 234
Automobile Radiators, Corrosion of Brass 55-430
Automobile Radiators by Electrodeposition 294
Automobiles, Use of Silver Plated Hardware on ... 230

—B—

Babbitt Metal, Invention of 143
Babbitt Metal, Making Graphite 173
Babbitt Metal, Original Formula for 143
Babbitt Metal, Revolving Mold for Casting 445
Babbitt Metal, Specifications for 175
"Baird" Fanning Mill for Removing Sawdust from Plated Work 134
Bakelite and Some of Its Uses 138
Ball Burnisher, A Rotary 245
Balls, Burnishing by Means of Steel 26
Barium Cyanide in Silver Plating 406
Barrel, New Electroplating 257-329
Barrels, The "Paxson-Warren" Sand-Blast Tumbling 369
Basse & Selve in Germany, Brass Rolling Mill of .. 155
Battery Zincs, Amalgamating 196
Bedstead Tubing, Heating Device for Lacquering .. 352
Bedsteads, Refinishing Old Brass 233
Bearing, Making a Graphite Babbitt-Metal 173
Bearings, Phosphor-Bronze Mixture for 205
Bearings, Porous Metals for 332
Bells, Flux for Use in Casting 170
Bells, Mixture for 169
Bench, Improved Form of Molder's 79
Bidet, A. 364
Billet, Making a Compound Copper & Steel 395
Black Nickel, see Nickel
Blacking of Brass, Cheap 292
Blistering of Silver Deposits 287-364
Blowpipe, Welding Brass by Oxy-Acetylene 215
Blowholes in Castings, Preventing 294
Bolts, Mixture for Cast Bronze 121
Bolts and Nuts, Hot Galvanizing 256
Boracic Acid in Nickel Plating Solutions, Determining 195
Boron for Deoxidizing Copper 166
Boron in Deoxidizing Copper, Use of 355-364
Boron Suboxide in Deoxidizing Copper 355-364
Boron Suboxide for Deoxidizing, Cost of 364
Brass, Addick's Method of Making 388
Brass Alloy Containing Silicon 390
Brass Analysis, Limits of Accuracy in 141
Brass Anodes, Use of 129
Brass Automobile Radiators, Corrosion of 55
Brass Bedsteads, Refinishing Old 233
Brass Bedstead Tubing, Heating Device for Lacquering 325
Brass and Bronze, Colors of 22
Brass and Bronze Plating Solutions and How to Make Them....49-95-129-170-206-244-275-352-397-437
Brass Castings, Sand-Blasting 269
Brass Castings, Use of Aluminum in 239
Brass, Cheap Blackening of 292
Brass Chips as Source of Ingot Metals 421
Brass Chips as Scrap Material, Extrusion 218
Brass and Composition, Right Method of Melting.. 229
Brass and Copper Rolling Mill in Germany 155
Brass, Crystallization of Sheet 289
Brass Deposits, Production of Heavy 437
Brass Deposits by Soft Metals, Absorption of 243
Brass, Effect of Ammonia on 81
Brass, Electric Welding of 278
Brass in England, Melting 137
Brass, Extending Use of Extruded 153
Brass Finish, Production of Brush 235
Brass Founders, "Easing-Up" on 293
Brass Foundry Mixtures, Standard 41-83-121-167-204-239-285-317
Brass, Government Testing and Inspection of 309
Brass, Grinding 236
Brass Ingots, Red 19-51
Brass Ingot, Manufacture of Yellow 421
Brass Manufacture, Wastes in 400
Brass Melting, Electric Furnace for Brass 357-387
Brass Melting, Electric Furnace in 305
Brass Melting in England, Notes on 66
Brass Melting Furnaces, Testing Relative Merits of 343
Brass Melting, Notes on Waste Occuring in 399
Brass Melting, Reducing Loss of Zinc in 434
Brass, Method of Adding Aluminum to 115
Brass Mixture for Brazing 317
Brass, Mixture for Fine Ornamental 240
Brass, Mixture of Green 21
Brass, Mixture for Yellow 285
Brass, Mixture for Yellow Castings of 239
Brass by Oxy-Acetylene Blowpipe, Welding 215
Brass, Oxygen in 394
Brass, Peculiar Case of Season Cracking of 81
Brass Plating Solutions, Spotting Out in 397
Brass Plating, Use of "Trisalytes" in 92
Brass for Rolling, Molds for Casting 381
Brass for Rolling, Preventing Piping in 407
Brass Saddlery Hardware, Mixture for Yellow 285
Brass, Season Cracking of 345
Brass Sheet, Specifications for High 132
Brass Solution, Use of Copper Anodes in 80-129
Brass Solutions, Cause of Difficulty in 207
Brass Solutions, Free Cyanide in 206
Brass Solutions, Hot and Cold 352
Brass Solutions, Use of Arsenic in 275

Brass Solutions, Use of Ammonia in 244
Brass Specifications, Sheet and Rod 234
Brass, Standard Methods of Sampling 136
Brass, The "Temper" of 132
Brass, Use of Common-Salt in Melting 307
Brass, Use of Lead in Yellow 240
Brass Wares in India, Manufacture of Art 291
Brass Wire and Rods, Electric Welding 197
Brasses by the Color, Distinguishing 330
Brazing Brass Mixture 317
Brazing, Liquid 408
Brazing of Metals 408
Brazing Solder 409
Britannia-Metal, Composite Sheet 243
Britannia-Metal, Disintegration of 98
Britannia-Metal Sheet, Compound 10
Bronze-Bolts, Mixture for 121
Bronze and Brass, Colors of 22
Bronze and Brass Plating Solutions and How to Make Them.. 49-95-129-170-206-244-275-352-397-437
Bronze Castings, Mixture for Hydraulic 168
Bronze Castings, Nickel for Increasing Strength of 402
Bronze Casting, Tests of a Large Gun 383
Bronze in a Cupola, Melting 57
Bronze Dies, Mixture for 205
Bronze, Grinding 236
Bronze Mixture, Antimony 205
Bronze Mixture, Hardware 121
Bronze Mixture for Hydraulic Castings, Nickel 434
Bronze Mixture, Statuary 45
Bronze, New Rolled Shapes in 176
Bronzes, Ancient 200
Bronzes, Use of Large Gate in Casting 319
Brown, J. L. R. 89
Brush-Brass Finish, Production of 235
Buffing, Difficulty of Removing Scratches by 438
Buffing Machine, Automatic 179
Buffing, Reducing the Cost of 141
Buffing Rooms, Eating Meals in 430
Buffing Silver Plated Ware 154
Buffing Wheels, Balancing Washer for 315
Bullion, Determination of Platinum in 248
Burnisher, A Rotary Ball 245
Burnishing by Means of Steel Balls..... 26
Burnishing Silver Flat-Ware, Buffing vs. 154

—C—

Cadmium and Silver Alloy, Electrodeposition of... 24
Cadmium in the United States, Production of..... 89
Calcium for Deoxidizing Magnesium, Use of 242
Canadium, a New Metal 59
Cans, Difficulty of Reclaiming Tin from 385
Carburetors, Mixture for 85
Case-Hardening Compound, New 310
Case-Hardening, Furances for 209
Cast-Iron, Difficulty of Plating Over-Pickled..... 333
Casting Brass for Rolling Molds for 381
Casting at Whitlock Coil Pipe Co., Making a Gun-Metal 383
Castings, Boron in Making Copper 355-364
Castings, Making High Conductivity Copper 419
Castings in Metal Molds, Manufacture of Soft 117
Castings, Nickel Bronze Mixture for Hydraulic.... 434
Castings, Preventing Blowholes 294
Castings, Skim-Gate for Making 255
Castings, Sand Blasting Brass 269
Castings, Use of Chills on Manganese-Bronze 231
Castings, Water Glass for Stopping Leaks in 133
Celluloid, Coating Plating Racks with 2
Celluloid, Inlaying with Metal 173
Canadian Nickel Supply, The 436
Centrifugal Machine for Purifying Aluminum 105
Cerium Alloys for Pyrophoric Work 326
Ceylon's Graphite Deposits 288
Chain Links, New Process of Soldering 86
Chills on Manganese-Bronze Castings, Use of 231
Chips as Scrap Material, Extrusion 218
Chrome-Steel Tubing 141
Chromium Alloy for Valve Seats, Cobalt 120
Chromium-Cobalt Alloy for Cutlery 203
Chromium Pyrophoric Alloy 180
Clamer, G. H. 357-387
Clamer's White Metal Alloy 80
Clays, Melting Points of 432
Cleaning Silverware, Apparatus for 293
Clocks as Scrap Material, Old 193
Cloth for Effect in Tarnishing Silver, Testing 351
Coal, Standard Methods of Sampling 136
Cobalt-Chromium Alloy for Cutlery 203
Cobalt-Chromium Alloy for Safety Valve Seats 120
Cobalt and Iron Alloy, Supermagnetic 400
Cobalt and Nickel, Production of 400
Cocks, Mixture for Red Metal 167
Cocks, Mixture for Yellow Brass 286
Coinage Alloys, Annealing of 404
Coins, Nickel for French 234
Coke Crucible Furnaces, Improved Tilting 371
Coke, Standard Methods of Sampling 136
Coloring Metals in Ammoniacal Baths 318
Composite Sheet Metals, New 176
Composite Soft Metals, Hoyt 243
Composition Castings, Sand Blasting 269
Composition Ingot, Manufacture of 421
Composition Ingot, Specifications for 19-51
Composition, Mixture for Use in Making 43
Composition, Right Method of Melting 229
Compound Britannia Sheet 10
Compound Copper and Steel Wire, Making 22
Conductivity Copper Castings, High 419
Copper, Absorption of Gases by 62
Copper Analysis, Limits of Accuracy in 141
Copper Anodes in Brass Solution, Use of 80
Copper Bearing Material, Old Clocks as 193
Copper Carbonate, Making 49
Copper Carbonate, How to Make 49
Copper Castings, High Conductivity 419
Copper Deposit, Cause of Rough, Acid 217
Copper Deposits by Soft Metals, Absorption of 243
Copper, Electric Welding of 277
Copper for French Coins, Nickel vs. 234
Copper, Improved Process of Refining 371
Copper, Improved Method of Purifying 436
Copper and Lead Anti-Friction Metal 208
Copper, New Method of Making Galvanoplastic Articles of 175
Copper without Oxidation, Annealing 209
Copper Plating Solution, Making a Cyanide 171
Copper Plating Wood 201
Copper Plating, Use of "Trisalytes" in 92
Copper from Scrap, Recovery of 399
Copper, Season Cracking of 345
Copper Solution, How to Make an Acid 198
Copper Solutions, How to add Carbonate of Copper to 386
Copper Stamping Metal, White 176
Copper and Steel Billet, Making a Compound 395
Copper and Steel Wire, Method of Making Compound 22
Copper, Use of Boron in Deoxidizing 166-355-364
Copper, Varying Quality of Electrodeposited 178
Copper, Welding 55
Copper Wire by Electricity, Annealing 445
Copper-Bronze Powder in Electroplating, Use of .. 201
Copper-Zinc-Silicon Alloy, New 65
Coppering Iron and Steel, Fire 65
Core-Flour, Adulteration of 392
Core-Oils in French Foundries 253
Core Testing, Machine for 61
Corrosion, Sodium Tungstate for Protecting Iron and Steel from 272
Corundum 93
Crucible Cover for Preventing Oxidation 254
Crucible Furnace, Improved "Steele-Harvey" 256
Crucible Furnaces, Improved, Coke Tilting 371
Crucible Furnaces, Recent Patents on 59
Crucibles, Artificial Graphite 281
Crucibles in England, Melting Brass in 137
Crucibles in Melting with High Pressure Gas 54
Crucibles for Melting Platinum, Lime 82
Crucibles in Oil Furnaces, Life of Graphite 91
Crystallization of Sheet Brass, Peculiar 289
Cupola, Melting Bronze in a 57
Cutlery, Electric Welding of 277
Cutlery, New Process of Making Table 137
Cutlery, Nickeling before Silver Plating 135
Cutlery, Use of Cobalt-Chromium Alloy for 203
Cyanide in Brass Solutions, Free 206
Cyanide in Electroplating, Sodium 404
Cyanide, Increasing Use of 192
Cyanide Plating Solutions, Preparing 92
Cyanide Solutions, Effect of Electric Current on .. 92
Cyanide, Testing for Value 95

—D—

Detinning, Improvement in 126
Detinning Old Tin Cans, Difficulty of 2

Dials, Silvering Steam-Gauge 435
Die in Making Hollow-Ware, Water 86
Die Castings, Apparatus for Making 255
Die Casting Apparatus, New Form of 128
Die-Castings, Notes on 39
Die-Casting Machine, New 66
Die Castings, Use of Zinc in 39
Dies, Mixture for Bronze 205
Dip, Improved Silvering 398
Dip Tinning, Producing Fine 333
Dross from Lead, Apparatus for Separating 63
Dross and What it is, Zinc 332
Drosses in Electric Furnace, Melting 3
Drying-Out Machine, New Form of "Tolhurst" 393
Drying-Out Process, New 60

—E—

"Eccentro" Balancing Washer for Polishing Wheels 315
Electric Cleaner for Steel Wire 391
Electric Furnace for Brass Melting 357-387
Electric Furnace in Brass Melting 305
Electric Furnace, Cost of Melting in 357-387
Electric Furnace for Melting Platinum, "Hellberger" 273
Electric Furnace for Melting Silver and Gold, Note on 48
Electric Furnace for Melting, The "Wile" 3
Electric Furnace Question, The 387
Electric Furnace, Tilting 181
Electric Welding and Its Application 277
Electric Welding Brass Rods and Wire 197
Electrical Apparatus, Cost of Operating 438
Electrical Fittings, Mixture for 84
Electrical Resistance of Metals, Effect of Nitrogen on 270
Electrodeposition, Automobile Radiators by 294
Electrodeposition, Effect of Heat on 178
Electrogalvanized Articles, Nickel Plating 385
Electrogalvanizing 100
Electrogalvanizing, Cleaning Anodes in 196
Electrogalvanizing, Machines for 100
Electrogalvanizing Over-Pickled Cast-Iron 333
Electrogalvanizing Solution, Improved 403
Electrogalvanizing Solution, New 62-105
Electrogalvanizing, see also Galvanizing.
Electroplating Apparatus, New Mechanical 329
Electroplating Glass, etc., New Method of 366-402
Electroplating Machine, The "Nonesuch" 257
Electroplating Machines, The "Potthoff" 100
Electroplating Obstacle, "Spotting-Out" Greatest of 40
Electroplating, Problems in 443
Electrogalvanizing Solution, New 434
Electrogalvanizing Solution, Use of Sal-Ammoniac in 429
Electroplating Solutions, Use of Wood Pulp in 251
Electroplating, Use of Storage Battery in 127
Electroplating, Use of Trisalytes for 246
Electroplating of Wood 201
Electrotypes of Nickel and Iron 213
Electrotyping, Improvement in 90-326
Emery Wheels for Grinding Brass 237
Emery Wheels, Lubricating 295
Emery Wheels, Manufacture of 93
Enamel for Steel, New 82
Enameled Ware, Testing 143
Etching and Piercing Metals by Transfer Process.. 11
Etching Solution, New 180
Extrusion Chips as Scrap Material 218
Extrusion Metal, Extending Use of 153

—F—

Fanning Mill for Removing Sawdust from Small Metal Goods 134
Faucets, Mixture for Red Metal 167
Faucets, Mixture for Yellow Brass 286
Files, Rotary 251
Film by Spinning, Production of Metal 214
Finishing Sheet Steel Articles by Tumbling 120
Fire Bricks, Melting Points of 132
Fire Coppering Iron & Steel 65
Fittings, Defects in Cheap 368
Fixtures, Defects in Cheap Gas 368
Flat-Ware Advertisement, Early 219
Flat-Ware, Black Nickel for French-Gray on Silver Plated 353
Flat-Ware, Buffing Silver Plated 154
Flat-Ware, Electric Welding of 277
Flat-Ware without Scrap 208
Flour, Adulteration of Core 392
Flux of Common-Salt in Brass Melting, Use of ... 307
Flux for Use in Casting Bells 170
Flux for Use in Soldering Aluminum 292
Flux for Use in Tinning 254
Flux for Welding Aluminum, New 50
Foil, Use of Aluminum in Place of Tin 396
Ford, A. P. 51
Forks, Early Manufacture of 219
Forks, Nickel Plating Previous to Silvering 135
Foundry Materials, Standard Methods of Sampling.. 136
French Foundries, Use of Core-Oils in 253
French-Gray Work, Black Nickel for 353
Furnace for Brass Melting, Electric 357-387
Furnace in Brass Melting, Electric 305
Furnace, Improved "Steele-Harvey" 256
Furnace for Melting Platinum, "Hellberger" 273
Furnace for Melting Silver and Gold, Gas vs. Electric for 48
Furnace for Melting, The "Wile" 3
Furnace Question, The Electric 387
Furnace, The "Rockwell" Underfired Annealing .. 365
Furnace, A. Tilting Electric 181
Furnaces with High Pressure Gas, Melting 54
Furnaces, Improved Coke, Tilting Crucible 371
Furnaces, Life of Crucibles in Oil 91
Furnaces for Melting and Annealing, Gas 9
Furnaces, Recent Patents on Crucible 59
Furnaces, Testing Merits of Melting 344
Fusel-Oil in Argentina 316
Fusel-Oil, Manufacture of Synthetic 276

—G—

Galvanized Scrap, Recovery of Zinc from 403
Galvanizing Bolts and Nuts, Hot 256
Galvanizing Process, New Hot 48
Galvanizing, Removing Scale from Pipes Previous to 295
Galvanizing, see also Electrogalvanizing.
Galvanoplastic Articles, New Method of Making .. 175
Gas-Cocks and Fixtures, Mixture for 240
Gas Fittings, Defects in 368
Gas Furnaces in Sheffield, England 9
Gas for Melting and Annealing, High Pressure 54
Gases by Copper, Absorption of 62
Gate, Duffy's Form of Skim 389
Gating for Manganese-Bronze 319
Gears, Mixture for Bronze 84
General Electric Co., Use of Boron Suboxide for Deoxidizing Copper in 364
German-Silver, Electric Welding of 277
German-Silver Flat-Ware, Early 219
German-Silver, Season Cracking of 345
German-Silver, Vanadium in Casting 392
Gilding, Silver Plating Ormolu Goods before 238
Glass, New Method of Electroplating 366-402
Glue for Effect in Tarnishing Silver, Testing 351
Gold Alloys, Annealing of 404
Gold Bullion, Determination of Platinum in 248
Gold Deposits by Soft Metals, Absorption of 243
Gold Deposits, Use of Nickel for Brightening 364
Gold, Electric Welding of 277
Gold, Gas vs. Electricity for Melting 48
Gold, Making Fulminate of 57
Gold Plating, Use of Trisalytes in 92
Gold and Silver Wares, Standards for Russian 320
Gold by Titanium, Hardening 176
Gold, Walter C. 93
Government Inspection and Testing of Material ... 309
Graphite Babbitt-Metal, Making a 173
Graphite Crucibles, Artificial 281
Graphite Crucibles in Oil Furnaces 91
Graphite Deposits, Ceylon 288
Grease Cups, New Method of Making 86
Grinding Aluminum, A "Kink" in 247
Grinding Brass and Other Alloys 236
Grinding Machine, The "Traud" Pan 27
Grinding Wheels, Balancing Washer for 315
Grinding Wheels, Lubricating 295
Gun-Metal Castings, Nickel for Increasing Strength of 402
Gun-Metal Casting, Strength of a Large 383

—H—

Hack-Saw Frames, New 293
Hardness of Metals, Methods of Testing 28
Hardware on Automobiles, Silver Plated 230
Hardware-Bronze Mixture 121
Hardware, Mixture for Marine 122
Hardware, Mixture for Saddlery 285
Hellberger Electric Furnace for Melting Platinum.. 273
Hering, Carl 357
Hollow-Ware, Method of Shaping 86
Hollow-Ware, Furnace for Annealing 211
Hose Couplings, Mixture for 317
"Hoyt" Composite Antimonial-Lead Sheet 243
Hoyt Metal Company's Compound Britannia Sheet 10
Hoyt-Silver 176
Hydraulic Castings, Nickel Bronze Mixture for 434
Hydraulic Metal Castings, Mixture for 168

—I—

Indian Art Brass Wares 291
Ingot, Manufacture of Brass and Composition 421
Ingot, Specifications for Composition 19-51
Ink for Conducting Electricity 332
Inlaying Celluloid 173
Iridium, Volatility of 272
Iron and Cobalt Alloy, Supermagnetic 166
Iron and Nickel Alloy, New 80-204
Iron and Nickel, Electrodepositing 213
Iron, Over-Pickled Cast 333
Iron, Roseleur's Tinning Solution for 180
Iron and Steel from Corrosion, Protecting 272
Iron and Steel, Fire-Coppering 65
Iron or Steel, Flux for Use in Tinning 254
Iron and Steel Goods, Rust Proof Coating for 324

—J—

Jewels, Tungsten Carbide for 179

—K—

Karr, C. Powell 274
Keller, Dr. Harry F. 439
Keys, Mixture for Bronze 168
Knives, New Process of Making 137
Knives, Nickel Plating before Silvering 135
Knives, Use of Cobalt-Chromium Alloy for 203

—L—

Lacquer, Amyl-Acetate in 351
Lacquer, Making "Bakelite" 138
Lacquers, Adherence and Wear of 116
Lacquering Bedstead Tubing, Heating Device for 325
Lampblack is Made, How 67
Lamps, Silver Plated Automobile 230
Lead, Apparatus for Atomizing 407
Lead, Apparatus for Separating Dross from 63
Lead and Britannia Metal Sheet, Compound 10
Lead Castings in Metal Molds, Making Antimonial 117
Lead and Copper Anti-Friction Metal, New 208
Lead Lined Piping on Shipboard 330
Lead, Process of Refining Scrap 195
Leaks in Casting, Stopping 133
Leonic-Ware in Bavaria, Manufacture of 284
Lester, H. H. 119
Leuchter's Method of Depositing Iron and Nickel.. 213
Lewis, Ernest A. 141
Lime Crucibles for Melting Platinum 82
Linotype Metal, Revolving Mold for Casting 445

—M—

Machinery, Cost of Operating Electrical 438
Magnesium, Casting Silicon by 364
Magnesium, Use of Calcium for Deoxidizing 242
Magnetic Alloy, A Super 166
Manganese in Alloys, Errors in the Use of 191
Manganese Bronze Castings, Use of Chills on 231
Manganese-Bronze Castings under Pressure, Leakage of 216
Manganese-Bronze, Cheap Mixture for 320
Manganese-Bronze, Mixture for Imitation 286
Manganese-Bronze, Use of Large Gate in Casting .. 319
Manganese Pyrophoric Alloy 180
Marine Hardware, Mixture for 122
McGrath Crucible Cover 254
Mercury as Cause of Season-Cracking of Brass 345
Mercury, The Demand for 290
Metal Films by Spinning, Making 214
Metal, Hoyt Composite Soft 243
Melting Brass and Composition, Right Method of .. 229
Melting Brass in Crucibles in England 137
Melting Furnaces in England, Notes on 66
Melting With Gas in England 9
Melting with High Pressure Gas 54
Melting Points of Metals, Accurate 354
Melting Points of Various Salts 316
Melting Silver and Gold, Gas vs. Electricity for .. 48
Melting, Use of Common-Salt in Brass 307
Metals, Absorption of Electrodeposits by Soft 243
Metals, Accurate Melting Points of 354
Metals, Apparatus for Atomizing Soft 407
Metals, Attaching Rubber to 349
Metals for Bearings, Porous 333
Metals, Effect of Nitrogen on 270
Metals, Joining of 409
Metals, Methods of Testing Hardness of 28
Metallurgy, Kindergarten 267
Mixtures, Standard Brass Foundry 41-83-121-167-204-239-285-317
Mold for Casting Metals for Rolling 407
Mold for Casting Type Metals, Revolving 445
Molds for Casting Brass Ingots, Tilting 426
Molders' Bench, Improved form of 79
Molders' Power Bench Rammer 252
Molds for Casting Brass, Surface of 381
Molds for Casting Soft Metals, Mixture for 167
Molds, Manufacture of Soft Metal Castings in Metal 117

—N—

Nails, Electrogalvanizing 100
Name Plates, Mixture for 85
"Neutrol" and Its Value in Silver Plating 406
Nickel Alloys, New 204
Nickel Alloy, New Cheap, White 435
Nickel Alloys, Use of Manganese in 191
Nickel Anode Connection, New Form of 131
Nickel Anode, "Leffel's" Form of 367
Nickel Anode, Most Economical Grade of 435
Nickel Anodes, Improvement in 367
Nickel Anode, New or "Economy" Form of 215
Nickel Anodes, Use of Manganese in 199
Nickel Anodes in Works of Basse & Selve 161
Nickel from Brass, Stripping 58
Nickel, Brightening Gold Deposits by 364
Nickel Bronze Mixture for Hydraulic Castings 434
Nickel and Cobalt, Production of 400
Nickel vs. Copper for French Coins 234
Nickel Deposits, Improving 199
Nickel Deposits, Obtaining Thick 391
Nickel Deposits, Stripping 212
Nickel, Electrodeposition of Black 56
Nickel in French Coins 309
Nickel for French-Gray Work, Black 333
Nickel for Increasing Strength of Bronze Castings 102
Nickel and Iron Alloy, New 80
Nickel and Iron, Electrodeposition of 213
Nickel on Nickel, Difficulty of Depositing 53
Nickel, Notes on Electrodeposition of Black 281
Nickel Plating Aluminum, French Method of 291
Nickel Plating Aluminum, German Method of 58
Nickel Plating Cutlery before Silvering 135
Nickel Plating Electrogalvanized Articles 385
Nickel Plating, New Recipe for 64
Nickel Plating Salts, "Prometheus" 250
Nickel Plating Salts, The Royal 396
Nickel Plating Sheet Steel Goods, Reducing Cost of 8
Nickel Plating Silver-Plated Cutlery 135
Nickel Plating Solutions, Determining Boracic Acid 195
Nickel Plating Solutions, New 391
Nickel Solutions, Over-Concentration in 306
Nickel Plating Solutions, Wood Pulp for 251
Nickel Salts, Analysis of "Prometheus" 318
Nickel Salts, Solubility of 179
Nickel Solutions, Use of Sal Ammoniac in 127
Nickel Supply, The Canadian 436
Nickel Wire for Spark Plug Points 331
Nickel Works in Belgium, New 309
Nigerian Tin, Pure 123
Nitrogen on Metals, Effect of 270

—O—

Oil Furnaces, Life of Graphite Crucibles in 91
Orcutt, D. P. 127
Organ Pipes, Decay of Tin 98
Ormolu Goods, Silvering Before Gilding 238
Ornamenting Metals with Silver, New Method of.. 370
Ovals and Circles, Machine for Cutting 403
Overpickled Cast-Iron 333
Oxidation, Annealing without 209
Oxidation, Crucible Cover for Preventing 254
Oxy-Acetylene Blowpipe, Welding Brass by 215

—P—

Palladium and Platinum 401
Palladium, Volatility of 272
Paper for Effect in Tarnishing Silver, Testing 351
Parrock, H. C. 19
Pattern Bronze, Mixture for 46
Phosphor-Bronze, Keeping Zinc Out of 1
Phosphor-Bronze Mixtures 204
Phosphor-Bronze, Season Cracking of 345
Photographers' Solutions, Recovery of Silver from.. 313
Photographers' Solutions, Recovery of Silver from 313
Piercing and Etching Metals by Transfer Process.. 11
Pin-Holes in Phosphor-Bronze, Cause of 1
Pipe, Bending 444
Pipes, Electrogalvanizing Iron 100
Pipes Previous to Tinning or Galvanizing, Removing Scale from 295
Piping in Castings, Preventing 407
Plated Work, Fanning Mill for Removing Sawdust from 134
Plated Work, New Method of Drying-Out 60
Plater vs. Brass Foundry in Spotting-Out 268
Plates, Mixture for Bronze Screen 169
Plating, see also Electroplating.
Plating Racks with Celluloid, Coating 2
Plating Racks, Modified 64
Platinum and Aluminum, Alloys of 319
Platinum, Electric Welding of 277
Platinum, The "Hellberger" Electric Furnace for Melting 273
Platinum, Lime Crucibles for Melting 82
Platinum; The Most Precious of Metals 439
Platinum in Ores, Bullion, Determination of 248
Platinum and Palladium 401
Platinum, Russian Coins of 441
Platinum, Standard for Commercial 406
Platinum, Volatility of 272
Plumbers' Brass Goods, Mixture for Red 167
Plumbers' Yellow Brass Goods, Mixture for 286
Pneumatic Casting Apparatus, Wetherill 255
Polishing Wheels, Balancing Washer for 315
Porcelain, New Method of Electroplating 366-402
Potash Industry in United States 327
Potassium Cyanide Solutions, Effect of Current on 92
Potassium Cyanide, Valuing 95
Potthoff, Louis 100
"Prometheus" Nickel Salts, Analysis of 318
"Prometheus", Nickel Plating Salts 250
Pyrometer, Continuous Chart 399
Pyrometer, New Form of "Brown" 90
Pyrophoric Alloy, New 180
Pyrophoric Alloys 325

—R—

Racks with Celluloid, Coating Plating 2
Racks, Modified Plating 64
Radiators, Correction of Brass Automobile .. 55-130
Radiators by Electrodeposition, Automobile 294
Rammer, Power Bench 253
Red Brass Ingots 19-51
Red Bronze, Mongrel Mixture for 295
Refining Copper, Improved Process of 371
Refining Scrap Lead 195
Resistance of Metals, Effect of Nitrogen on Electrical 270
Rhodium, Volatility of 272
"Rockwell" Underfired Annealing Furnace 365
Rod and Wire, Electric Welding Brass 197
Rolling, Casting Brass for 381
Rolling, Casting Metals for 407
Rolls for Rolling Metal, Use of Steel 252
Rose, T. Kirke 404
Rubber to Metals, Attaching 348
Rubber, Peculiar Case of Nickel Depositing on .. 315
Russian Gold and Silver Wares, Standards for 326
Rusting, Protecting Iron and Steel from 272
Rust-Proof Coating for Iron and Steel, New 324
Rust-Proofing of Large Steel Objects 247
Ruthenium, Volatility of 272

—S—

Saddlery Hardware, Mixture for 285
Sal-Ammoniac in Electrogalvanizing Solution, Advantage of 429
Sal-Ammoniac in Nickel Solutions, Use of 420
Safety Valve Seats, Cobalt-Chromium Alloy for .. 120
Salt in Melting Brass, Value of Common 307
Salts, Melting Points of Various 316
Sampling, Standard Methods of 136
Sand-Blast, New Self-Contained 24
Sand-Blast Tumbling Barrels, "Paxson-Warren" .. 369
Sand-Blast and its Value in Brass Foundry 269
Sand-Blasting Molds for Casting Brass 381
Sawdust from Articles, Fanning Mill for Removing 134
Sawdust in Drying Out, Machine for Obviating Need of 385
Sawdust in Drying Out, Machine for Use of 60
Sawdust from Plated Work, Fanning Mill for Removing 134
Scale Beams, Mixture for 121
Scrap Lead, Process of Refining 195
Scrap, Making Flat-Ware without 208
Scrap Material, Old Clocks as 193
Scrap Metal Material, Extrusion Chips as 218
Scrap Metal Trade, Importance of 199
Scrap, Recovery of Copper from 399
Scratches by Buffing, Difficulty of Removing 438
Screen Plates, Mixture for Bronze 169
Season-Cracking of Brass as Caused by Mercury .. 345
Season-Cracking of Brass, Peculiar 81
Shapes in Steel and Bronze, New Rolled 177
Shells, Cause of Cracking of Brass 345
Sherardizing Furnace, Modification for 321
Silicon, Brass Alloy Containing 390
Silicon by Magnesium, Casting 363
Silicon, New Alloy Containing 65
Silver Alloys, Annealing of 404
Silver Anodes, Cause of Black Slime on 87
Silver Anodes, Purity in 87
Silver, Black Nickel for French-Gray on 353
Silver and Cadmium Alloy, Electrodeposition of .. 24
Silver Cyanide and Its Properties 312
Silver Deposit Process, New 54
Silver Deposit Work, Blistering of 364
Silver Deposits, Blistering of 287
Silver Deposits, Note on Bright 119
Silver Deposits, Relative Tarnishing of 119
Silver Deposits by Soft Metals, Absorption of 243
Silver Deposits, Yellow 288
Silver, Determination of Platinum in 248
Silver in Electric Furnace, Melting 3
Silver, Electric Welding of 277
Silver Finish, New White 394
Silver, Gas vs. Electric Furnaces for Melting 48
Silver and Gold, Standards for Russian 320
Silver, New Method of Ornamenting with 370
Silver Nitrate in Silver Plating Solutions 382
Silver from Photographers' Solutions, Recovery of 313
Silver-Plate, British Standard of 405
Silver Plated Hardware on Automobiles 230
Silver Plated Ware, Buffing 154
Silver Plating, Barium Cyanide in 406
Silver Plating, Nickel Plating Cutlery before 135
Silver Plating Ormolu Goods before Gilding 238
Silver Plating Solutions, Ammonia in 284
Silver Plating Solutions, "Neutrol" in 406
Silver Plating Solutions, Old 78
Silver Plating Solutions, Use of Silver Nitrate in 382
Silver Plating, Use of "Trisalytes" in 92
Silver Sweeps, Machine for Grinding 27
Silver, Testing Paper, Glue and Cloth for Effect in Tarnishing 351
Silver by Titanium, Hardening 176
Silver Sweeps, Machine for Grinding 26
Silvering Dip, Improved 398
Silvering Paste 435
Silverware, Cleaning 293

Silverware, Electrolytic Removal of Tarnish from 320-323
Skim-Gate, Duffy's Form of 389
Skim-Gate for Making Sand Castings, New 255
Skim-Gate, Perforated Core 389
Skimmings, Recovering Zinc from Sal-Ammoniac .. 446
Soap-Bark in Tumbling Zinc Goods, Use of 271
Sodium Cyanide 192
Sodium Cyanide in Electroplating 404
Sodium, Danger in Transportation of Metallic 246
Sodium Tungstate for Protecting Iron and Steel .. 272
Soft-Metal Films by Spinning, Making 214
Soft Metals, Atomizing 407
Solder for Aluminum 319
Solder, Brazing 409
Solder, Specifications for 174
Solder, Specifications for Wiping 174
Solder, Tinman's 408
Soldering Aluminum, Flux for Use in 292
Soldering Aluminum, New Process for 252
Soldering Chain Links, New Process of 86
Soldering of Metals 408
Solubility of Double and Single Nickel Salts 179
Specifications for Babbitt-Metal 175
Specifications for High Brass 132
Specifications for Sheet and Rod Brass 234
Specifications for Solder 174
Spelter Castings in Metal Molds, Making 117
Spelter, Molds for Casting 167
Spelter, see also Zinc.
Sperry, Erwin S. 345
Spoons and Forks, Buffing Silver Plated 154
Spoons and Forks without Scrap, Making 208
Spotting-Out in Brass Plating Solutions 397
Spotting-Out Difficulties 40
Spotting-Out, Hot Water as Remedy for 311
Spotting-Out, Plater vs. Brass Founder in 268
Stamping Metal, White Copper 176
Stampings without Oxidation, Annealing 209
Statuary Bronze Mixture 45
Steam-Metal Mixture 83
Steel Articles by Tumbling, Finishing Sheet 120
Steels Balls, Burnishing by Means of 26
Steel Billet, Making a Compound Copper and Steel 395
Steel, Case-Hardening Compound for 310
Steel Cutlery, Nickeling Before Silvering 135
Steel, Enamel for 82
Steel, Etching 11
Steel Goods, Reducing Cost of Nickel Plating Sheet 8
Steel and Iron , Fire Coppering 65
Steel or Iron, Flux for Use in 254
Steel, A Method of Nickel Plating Sheet 8
Steel, New Rolled Shapes in 177
Steel Rolls for Cold Rolling Metals 252
Steel, Roseleur's Tinning Solution for 180
Steel, Rust Proof Coating for 324
Steel, Rust-Proofing of Large Articles of 247
Steel, Standard Methods of Sampling 136
Steel Tubing, Chrome 141
Steel Tubing, Improved Process of Making Square 140
Steel Wire, Compound Copper 22
Steel Wire, Electric Cleaner for 391
"Steele-Harvey" Crucible Furnace, Improved 256
Stoneware, New Method of Electroplating 366-402
Storage Battery in Electroplating, Use of 127
Stripping Nickel from Brass 53
Sulphuric Acid and Water, How to Mix 310
Sweeps, Machine for Grinding Silver 26

—T—

Tarnish from Silver, Electrolytic Removal of ...320-323
Testing of Government Material 309
Testing the Hardness of Metals, Method of 28
Testing Machine for Cores 61
Tin, Apparatus for Atomizing 407
Tin Cans, Difficulty of Detinning Old 2
Tin, Disintegration of 77-96
Tin Dross in Electric Furnace, Smelting 3
Tin-Foil, Use of Aluminum in Place of 396
Tin, "Infected" 77-96
Tin from Old Tin Cans, Reclaiming 385
Tin, No Substitute for 420
Tin, Pure Nigerian 123
Tinning, Attempts to Cheapen 432
Tinning, Flux for Use in 254
Tinning, Producing Fine Dip 333
Tinning, Removing Scale from Pipes Previous to .. 295
Tinning Solution, Roseleur's 180
Titanium Alloys, Making 143
Titanium, Hardening Gold and Silver by 176
Titanium in Purifying Aluminum, Use of 126
"Tolhurst" Dry-Out Machine, New Form of 393
Transfer Process for Etching 11
"Traud" Pan Grinding Machine 27
Tripoli and its Markets 272
Trisalytes in Electroplating 92
Trisalytes for General Plating 246
Trolley Fittings, Mixture for 46
Trolley Wheels, Mixture for 46
Tubing, Bending 444
Tubing, Chrome-Steel 141
Tubing, Heating Device for Lacquering 325
Tubing, Improved Process of Making Square Steel 140
Tucker, Alex. E. 408
Tumbling Barrels, The "Paxson-Warren" Sand-Blast 369
Tumbling, Finishing Sheet Steel Articles by 120
Tungsten Carbide for Meter Jewels 179
Tungsten, Increasing Ductility of 105
Tungsten, Uses of 328
Turner, Prof. Thomas 394
Type Metals, Mold for Casting 445

—V—

Valve Castings, Water Glass for Stopping Leaks in 133
Valve Seats, Cobalt-Chromium Alloy for 120
Valves, Leakage of Manganese-Bronze 216
Valves, Mixture for 83
Vanadium Alloys and Their Application 274
Vanadium in Casting German-Silver 392
Vanadium in Chili, Argentina and Peru 322
Vaughan-Hughes Method of Annealing without Oxidation 209
Valatility of Rare, Noble Metals 272
Vienna-Lime Cans, Splitting of 430

—W—

Washer for Polishing Wheels, Balancing 315
Water-Glass for Stopping Leaks in Valve Castings 133
Weber, Dr. M. G. 92
Weintraub, Dr. E. 355
Welding Aluminum, New Flux for 50
Welding Aluminum, Process for 324
Welding Brass by Oxy-Acetylene Blowpipe 215
Welding Brass Wire and Rods, Electric 197
Welding Copper 55
Wetherill Pneumatic Casting Apparatus 255
White-Metal Alloys, Cheap 204
Whipple & Choate, Making Ingot Metals at Works of 421
Whitlock Coil Pipe Co., Making Gun Metal Casting at 383
"Wile" Electric Furnace for Brass Melting 3
Wire, Electric Cleaner for 391
Wire while Red Hot, Drawing 181
Wire by Electricity, Annealing 445
Wire and Rods, Electric Welding Brass 197
Wire Solder, Specifications for 174
Wood, Electroplating of 201

—Z—

Zinc, Absorption of Electrodeposits by 243
Zinc Anodes, Alloyed 47
Zinc and Aluminum Alloys, Rolling 290
Zinc and Aluminum, Use of Soap-Bark in Tumbling 271
Zinc, Annealing of Sheet 123
Zinc in Brass Melting, Reducing Loss of 434
Zinc Castings in Metal Molds, Making 117
Zinc Carbonate, How to Make 49
Zinc in Die Castings, Use of 39
Zinc-Dross and What It is 332
Zinc from Galvanized Scrap, Recovery of 403
Zinc Electrodeposition, see Electrogalvanizing
Zinc Out of Phosphor-Bronze, Keeping 1
Zinc Oxide, Volatility of 180
Zinc Plating Solution, New 105
Zinc, Process for Coating with 48
Zinc, Production of Cadmium from 89
Zinc from Sal-Ammoniac Skimmings, Recovering .. 446
Zinc, Strength of Rolled 123
Zincs, Amalgamating Battery 196
Zinc, see also Spelter.

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and their Alloys